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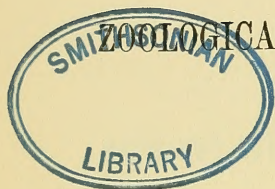
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PROCEEDINGS  
OF THE  
GENERAL MEETINGS FOR SCIENTIFIC BUSINESS  
OF THE  
ZOOLOGICAL SOCIETY OF LONDON.  
1902, Vol. II. (May to December).

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May 6, 1902.

Prof. G. B. HOWES, LL.D., F.R.S., Vice-President,  
in the Chair.

The Secretary read the following report on the additions made to the Society's Menagerie in April 1902:—

The registered additions to the Society's Menagerie during the month of April were 208 in number. Of these 19 were acquired by presentation, 45 by purchase, 19 were born in the Gardens, and 125 were received on deposit. The total number of departures during the same period, by death and removals, was 139.

Amongst the additions are the first examples that we have received of the beautiful Grey Teal (*Querquedula versicolor*) of the Argentine Republic, obtained by purchase at the Antwerp sale.

---

The Secretary called attention to a specimen of Moth of the genus *Cossus*, which had been sent home in chrysalis by Mr. W. L. Slater, F.Z.S., from the Cape (Feb. 27th, 1901), and had emerged in the Insect-house, as mentioned by Mr. A. Thomson in his Report (P. Z. S. 1902, vol. i. p. 204). Mr. Slater had sub-

mitted this specimen to Mr. R. Trimen, F.R.S., who had favoured him with the following remarks upon it:—

“On comparison of the specimen with the series in the British Museum, there can be no doubt at all that it is a veritable *Cossus ligniperda*, or ‘Goat-Moth.’

“It would be interesting to know the history of this example, for there can be no question that timber-burrowers are carried about the world more than most insects, and it seems possible that the larva of this *Cossus* may have travelled in logs to the Cape, and been developed there, and so been sent home as a South-African insect.

“It is also not altogether unlikely that the species may have been introduced into South Africa and have established itself there, as it feeds on several different trees, and the willow (one of its food-trees in Europe) is represented by a closely-allied *Salix* in South Africa.”

---

The following papers were read:—

1. On the Mammals collected during the Whitaker Expedition to Tripoli. By OLDFIELD THOMAS.

[Received March 26, 1902.]

(Plate I.<sup>1</sup>)

Mr. J. I. S. Whitaker, E.Z.S., who has already done so much for the exploration of the Vertebrate Fauna of Northern Africa, and to whom our National Museum is indebted for important collections of Mammals from Sicily, Tunis, and Morocco, has long wished to send a collecting expedition into the little-known country of Tripoli. Last year, by the kind intervention of the Foreign Office, permission was obtained from the Sultan for Mr. Edward Dodson and a companion, Mr. Drake, to travel through that country, collecting specimens, and it is the Mammalian results of this expedition of which the present paper gives an account.

The expedition was carried out entirely at Mr. Whitaker's expense, and, as in the case of the previous Moroccan expedition, he has generously presented the great majority of the Mammals collected to the National Museum, to which they form a most valuable addition.

As so often happens in such cases, the material available for comparison with the Tripoli collection is most imperfect, and badly needs supplementing by specimens collected in modern fashion. Indeed, of Barbary Mammals the only modern specimens are those of Mr. Eaton from Biskra, and Mr. Dodson's own previous collections from Morocco. Zoologists, therefore, who spend their winters in the south would do a great service to

<sup>1</sup> For explanation of the Plate, see p. 13.







Science and the Museum if they would collect any mammals, however common, at the places they go to.

Mr. Dodson left the town of Tripoli on April 2nd, 1901, and travelled southwards by way of Sokna to Murzuk, then returned to Sokna, and from there travelled north-eastwards to the Syrt district, where he worked eastwards along the coast to Ben-Ghazi.

His localities are thus divisible into four groups, as follows :—

I. Inland country north of Sokna. March 1901 and middle of June to middle of July. Specimens collected at Tarhuna, Wadi Sofedjin, W.<sup>1</sup> Nefed; W. Bey; Bonjem; Erdeul; Ain Hammam; W. Titti; W. Agarib; W. Wagis; Oumsinerna; Limhursuk; Gebel Binsertia.

This is a desert region, without marked elevations; interspersed with small oases.

II. Soda Mountain district just south of Sokna (28° 55' N., 16° 15' E.). Beginning of May and second week of June. *Localities.* Tamari-Ferdjan; W. Sultan; Getefa; Linzerat.

The Soda Mountains rise to about 3000 ft. above the general level of the plain, not high enough therefore to have any noticeable climatic or faunal peculiarity. There is a map of this district in Rohlf's 'Kufia' (1881).

III. Level and descending country southwards to Murzuk (sea-level or below). *Localities.* Shup; Oum el Abid; Zighen; Sebha; Ghodua; Murzuk.

IV. Coast district eastwards from Syrt towards Ben Ghazi. End of July and beginning of August. W. Aggar; Elcusher; Bon Cheifa; Sidi Sweya; Sidi Faradje.

From a geographical standpoint, therefore, the region traversed is of a very good representative character. But, zoologically, there must be many more species which, on account of the hurried nature of the march, and the difficulties in collecting in so wild and semi-hostile a country, must have been missed by Mr. Dodson's party. Indeed, under the circumstances it is surprising how admirable a collection has been made.

As might be expected from the position of Tripoli between Egypt and Algeria, and the homogeneous nature of all three regions, the mammals have no marked general affinity or peculiarity. Some, such as *Acomys*, *Gerbillus pyramidum*, *G. eatoni*, and *Dipodillus vivax*, are Egyptian in affinity; and others, notably the *Ctenodactylus*, are distinctly Algerian; but these affinities are evidently only the eastward and westward extensions, hitherto unknown, of Algerian and Egyptian forms, and there seems to be no special faunal relationship with either of the two countries more than the other.

The proportionate number of new forms in the collection is remarkable, the most notable being the *Ctenodactylus* and the fine Hare which I have named in honour of Mr. Whitaker, to whose enterprise and generosity the expedition is due, and who is to be congratulated on its very successful outcome.

<sup>1</sup> W. = Wadi.

1. *PIPISTRELLUS DESERTI*, sp. n.

71. ♂. Mursuk. 30/5/1.

A small buff-coloured desert ally of *P. kuhli*, with a particularly small skull.

Size smaller than *P. kuhli*, but the forearm-length not so much less than in that form as to be in proportion with the much smaller skull. General structure, of ears, wings, and dentition, as in *P. kuhli*. Ears and tragus pale transparent buffy, little darker than the general colour. Wings dark brown, the usual white edging very conspicuous. Interfemoral paler brown, white posteriorly.

Colour of fur pale buffy, between cream and pinkish buff of Ridgway, strikingly different from the colour in ordinary *kuhli*. The hidden bases of the hairs dull slaty. Belly-hairs blackish slaty basally, whitish buff terminally.

Skull very small and delicate; the total length, the breadth across brain-case, and the length of the tooth-series, all conspicuously less than in *P. kuhli*, whether from Europe, Morocco, Tunis, or Egypt.

Dimensions of the type:—

Forearm 29.5 mm.

Head and body (measured in flesh) 43; tail (do.) 33; ear (do.) 10; third finger, metacarpal 29, first phalanx 10, second phalanx 8.5; lower leg and hind foot (c.u.) 22.

Skull—greatest length 11.6, median length above 10, median length below 9; interorbital breadth 4.1; intertemporal breadth 3.1; breadth of brain-case 62; front of canine to back of *m*<sup>3</sup> 4.3.

*Type.* Adult male. Original number 71.

Although with the general characters of *P. kuhli*, I do not feel justified in calling this Bat only a subspecies of that animal, for other North-African bats of this group, while tending towards *P. deserti* in colour, show no approach to its conspicuous reduction in size of skull. Examples of *P. kuhli* from Morocco (*Dodson*), Tunis (*Anderson*), and Egypt (*Anderson*), all have skulls of the full normal size.

Two names might have been thought to refer to it. *Cretzschmar's V. marginatus* from Nubia is paler in colour than usual, but Dr. Anderson's specimens show that the form from there is of the usual size.

*Pipistrella minuta* Loche<sup>1</sup>, on the other hand, is so far smaller as either to be a totally different form, or, more probably, the young of some indeterminable species. Its locality is in the Algerian range of *P. kuhli*.

2. *HYÆNA HYÆNA* L.

43. Getefa, near Sokna. 5/5/1.

<sup>1</sup> Expl. Scient. Alg. p. 78 (1867).



## 3. CANIS sp.

Skull: "Found in ancient water-reservoir at Sidi Abdul Arbi."  
Probably a domestic dog.

## 4. VULPES sp.

Skull: "Found in old reservoir at Sidi Faradje."

This skull is not distinguishable from that of a female *V. ægyptiaca* from the Lower Nile.

## 5. GERBILLUS PYRAMIDUM TARABULI, subsp. n.

15. 16. 28. 31. Ain Hamman. 27/4/1-2/5/1.

35. 36. 38. 41. Tamari-Ferdjan. 5/5/1.

42. Linzerat. 7/5/1.

47. 48. 49. 51. 52. Oum el Abid. 10/5/1.

56. 57. 58. 59. Zighen. 15/5/1.

67. 69. Ghodua. 23/5/1.

64. 65. 73. 74. 75. 76. Sebha. 19/5/1-5/6/1.

89. El Koshby. 18/6/1.

91. W. Sultan. 18/6/1.

92. 95. Ferdjan. 19-20/6/1.

98. 99. 102. 103. Ain Hamman. 24/6/1.

105. 106. 107. 109. 114. W. Agarib. 29/6/1-3/7/1.

154. W. Aggar. 25/7/1.

Size, proportions, and skull as in typical *G. pyramidum* from Lower Egypt, but the colour of the upper surface uniformly bright ochraceous buff, not darker or more brownish on the back. This same bright colour is present even in the young. Post-auricular white patch conspicuous.

Dimensions of the type, measured in the flesh:—

Head and body 105 mm.; tail 149; hind foot (s.u.) 30; ear 15.

Skull—greatest length 32·7; basilar length 25; greatest breadth 17·2; nasals, length 13; interorbital breadth 6·6; diastema 9; palatal foramina 6; length of upper molar series 4.

*Hab.* of type. Sebha.

*Type.* Female. No. 76. Killed June 5, 1901.

The typical *G. pyramidum*, although its sides are bright ochraceous, has the dorsal area, at least posteriorly, darkened and more or less lined with brown. In the Tripolitan series the ochraceous covers the whole upper surface. The Nubian *G. pygargus*, on the other hand, of which the Museum has a fine series from Shendy, obtained by the Hon. N. C. Rothschild, although similar to *G. p. tarabuli* in colour, is markedly smaller, both in skull and foot.

No representative of *G. pyramidum* has as yet been found in Algeria.

## 6. GERBILLUS GERBILLUS Oliv.

24. 30. Ain Hammam. 28-29/4/1.

63. Attieh Louileh. 5/1.

70. Ghodua. 23/5/1.

- 77.78. Loumoulieh. 6-7/6/1.  
 80.81.82. Shup. 8-9/6/1.  
 101. Ain Hammam. 24/6/1.  
 154. W. Aggar. 25/7/1.

I can find no satisfactory distinction between these specimens and topotypes from Lower Egypt.

The Algerian representative of *G. gerbillus* is Lataste's *G. hirtipes*. A specimen in his collection—No. 1595—one of the co-types labelled by him, has the molars 1·4 mm. in breadth. Should he prove to have mixed up any other form among his rather diverse series, this skull, the length of which (28·5 mm.) was given in the original description, might be considered as the type.

#### 7. GERBILLUS EATONI, sp. n.

113. W. Agarib. 3/7/1.  
 147. 148. 149. 151. Elcusher. 24/7/1.  
 159. W. Aggar. 26/7/1.

A representative of the Egyptian *G. andersoni* de Wint.

General colour comparatively dark, finely lined with brown, very different to the brilliant clear tone of *G. hirtipes*. Feet short and stout, shorter than in *G. hirtipes*. Tail with its crest short, but distinctly blackened, the longest hairs about 4 mm. in length.

Skull with a larger and more rounded, bulbous, brain-case than in *G. andersoni*; bullæ also rather larger than in that species.

Dimensions of the type:—

Head and body 93 mm.; tail 128; hind foot (s. u.) 25; ear 13.

Skull—greatest length 29; basilar length 21; zygomatic breadth 16; nasal length 10·6; interorbital breadth 5·7; brain-case, breadth 14; diastema 7·3; palatal foramina 5·1; length of upper molar series 4·1; greatest diameter of bulla 10·8.

*Hab.* of type. Elcusher.

*Type.* Male, not old. Original number 149. Killed 24 July, 1901.

This Gerbille represents the Egyptian *G. andersoni* de Wint., and is distinguished from that animal by its larger and more bulbous brain-case.

Besides their other differences in colour and proportions, the three forms of Hairy-footed Gerbille obtained by Mr. Dodson are distinguishable by the breadth of their molars, *G. p. tarabuli* having these about 1·7 across the broadest part of *m*<sup>1</sup>, *G. eatoni* 1·5 or 1·6, and *G. hirtipes* 1·4. An old specimen with worn teeth, collected by Mr. O. V. Aplin in Tunis in 1895, and also presented to the Museum by Mr. Whitaker, seems likewise to be referable to *G. eatoni*.

I have named this pretty Gerbille in honour of the Rev. A. E. Eaton, to whose collections from Algeria our ability to work out any North-African Muridæ is largely due. The old inexactly labelled material is of little use, and Mr. Eaton's specimens are the only ones in the Museum from Algeria collected in proper

style. It is to be hoped that they may be soon further supplemented.

8. *DIPODILLUS DODSONI*, sp. n.

6. 8. 9. W. Nefed. 14-15/4/1.

18. 21. 22. 23. 25. 29. Ain Hammam. 27-29/4/1.

34. 37. 39. Tamari-Ferdjan. 5/5/1.

46. 50. 55. Oum el Abid. 11-14/5/1.

68. Grodua. 23/5/1.

79. 83. 84. Shup. 8-10/6/1.

100. Ain Hammam. 24/6/1.

100. W. Agarib. 1/7/1.

Essential characters of *D. campestris*, but larger, more desert-coloured, and with a longer and more heavily tufted tail.

Size larger than in the true *D. campestris* of the coast-lands.

Fur longer and looser. General colour above sandy buff, varying from light ochraceous buff to a dull isabella. Usual orbital and postauricular white patches present. Under surface pure white, the line of demarcation less sharply defined than in the closer-haired *D. campestris*. Ears of medium size, naked; clear greyish. Hands and feet white; palms and soles naked; six sole-pads present. Tail very long, heavily tufted in its terminal half, the hairs of the tip attaining about 15 mm. in length; its base sandy above, white below, the tuft brown above, duller white below.

Skull quite like that of *D. campestris*, but rather larger in all dimensions.

Measurements of the type:—

Head and body 101 mm.; tail 143; hind foot 28 (range 26-29); ear 15.

Skull—greatest length 31; basilar length 22.2; zygomatic breadth 16.5; length of nasals 12; interorbital breadth 5.1; diastema 8; palatal foramina 5.5; upper molar series 4.1.

Typical locality. Ain Hammam.

*Type.* Adult male. Original number 29. Killed 29 April, 1901.

This fine tufted-tailed Gerbille is the representative of *D. campestris* south of the Atlas, and was not distinguished by Lataste from that species. But the true *D. campestris* of the coast-lands of Algeria is rather smaller, much browner in colour, and its tail has far less tuft than *D. dodsoni*. The type locality was Philippeville, on the coast of Constantine, and examples from the coast as far westward as Mogador practically agree with those from this district. On the other hand, on the south side of the mountains, desert Algerian examples, obtained by Mr. Eaton at Biskra, are referable to the Tripolitan *D. dodsoni*.

Of the four species of Loche and Levailant said with doubt by Lataste to belong to the *campestris* group:—

No. 69, *Gerbillus deserti*, is clearly not this species, being far too short-tailed. It is perhaps a young *G. hirtipes* or *G. simoni*.

No. 70, *G. gerbii*, comes from Beni Sliman, about 40 miles south of Algiers. Therefore north of the mountains, and within the area of true *G. campestris*.

No. 72, *Psammomys minutus*, is possibly *D. dodsoni*, but the name is unavailable, being based on the totally different *Dipus minutus* Geoffr.

No. 80, *Mus chamæropsis*, is clearly a *Mus*, as its smooth incisors testify.

9. *DIPODILLUS VIVAX*, sp. n.

27. Ain Hammam. 29/4/1.

66 Sebha. 19/5/1.

Closely allied to the Egyptian *D. quadrimaculatus* Lat. and *amœnus* de Wint., which it no doubt replaces in Tripoli.

Size as in *D. amœnus*. General colour above bright uniform ochraceous buff, scarcely lined with brown. Belly and limbs pure white. Upper whiskers brown, lower white. Usual white face-marks well defined. Tail about as long as in *D. amœnus*, pencilled above terminally, the hairs about 10 mm. in length; pale fawn lined with brown above, the pencil-lines brown, below paler, or whitish fawn.

Skull very like that of *D. amœnus*, rather smaller than that of *D. quadrimaculatus*; differing from both by its decidedly larger bullæ, and the consequent narrowness of the basioccipital between them.

Dimensions of the type:—

Head and body 75 mm.; tail damaged (of the second specimen 106); hind foot 21; ear 12.

Skull—greatest length 26·7; basilar length 19·7; zygomatic breadth 14·5; nasal 9·7; interorbital breadth 4·4; breadth of brain-case 12·6; diastema 6·7; palatal foramina 4·2; greatest diameter of bullæ 10·1; length of upper molar series 3·2; width of *m*<sup>1</sup> 1·2.

Typical locality. Sebha.

*Type*. Male. No. 66. Killed 19 May, 1901.

This Tripolitan representative of the *quadrimaculatus*-group is readily distinguishable from its Egyptian allies by its larger bullæ and brighter and more uniform ochraceous buffy colour. No members of the group have been recorded from Algeria.

10. *MERIONES SHAWI* Rozet.

2. Tarhuna. 6/4/1.

4. 5. 7. 11. W. Nefed. 14–15/4/1.

146. 150. Elcusher. 24/7/1.

152–153. 156. 157. 158. W. Aggar. 25–26/7/1.

162. Bou Cheifa. 2/8/1.

In spite of the large number of localities at which one or other of the two species were taken, it is noticeable that at no single place did Mr. Dodson catch both *M. shawi* and *M. schousboei*. Perhaps they will prove to be mutually exclusive, as they are so



alike in size and general characters. Indeed it is almost impossible to distinguish them externally from each other, though *M. shawi* has on the average a rather duller or more drab tone than *M. schousboei*. Nor are the skulls less alike, except for the characteristic difference in the size of the bullæ.

#### 11. MERIONES SCHOUSBOEI Loche.

*Gerbillus schousboei* Loche, Expl. Sci. Alg., Mamm. p. 105 (1867),

20. 26. 33. Ain Hammam. 28/4-2/5/1.

40. Tamari-Ferdjan. 5/5/1.

53. 54. Oum el Abid. 13-14/5/1.

60. Zighen. 15/5/1.

72. Serir, Mursuk. 1/6/1.

88. Koshby. 16/6/1.

93. 94. 96. 97. Ferdjan. 19-21/6/1.

112. W. Agarib. 3/7/1.

115. 116. W. Wagis. 7/7/1.

121-135. 138-142. G. Limhersuk. 14-19/7/1.

143-144. Gebel Binsertia. 20/7/1.

163. Sidi Sweya. 5/8/1.

Although the group is too difficult to be worked out in detail, the name adopted seems the best to use for the Barbary representative of the *M. erythrurus*-group. Its reference to that group is accepted on the authority of Lataste.

#### 12. PSAMMOMYS TRIPOLITANUS, sp. n.

155. W. Aggar. 25/7/1.

160. W. Cheggar. 28/7/1.

161. Bou Cheifa. 1/8/1.

Size fairly large, though smaller than in *P. algiricus*. Median facial and dorsal area dark buffy (something between "wood-brown" and "pinkish-buff"). Sides and belly yellow. Cheeks pale greyish. Upper surface of hands and feet yellowish white. Tail strong buffy, the crest and pencil black; terminal hairs of pencil attaining about 14 mm.

Skull smaller and more delicately built than in the other large species, though markedly larger than in *P. roudairei*. See dimensions below. Bullæ small and narrow; the part that appears on the top of the squamosal particularly small.

Dimensions of the type:—

Head and body 157 mm.; tail 135; hind foot 35; ear 14.

Skull—greatest length 41.5; basilar length 34.3; zygomatic breadth 24; nasals 15.3; interorbital breadth 6.5; least breadth between ridges on parietals 10.5; breadth between anterior lips of meatus 24; length of exposed upper area of bulla 5.4; diastema 12.1; greatest diameter of bulla 14.3, lesser diameter, from anterior lip of meatus, 11.5; length of upper molar series 6.8.

Typical locality. Bou Cheifa, on the coast.

Type. Old male. No. 161. Killed 1 August, 1901.



As shown elsewhere<sup>1</sup>, the species of *Psammomys*, apart from *Ps. elegans*, which I do not know, and the much smaller *Ps. roudairei*, fall readily into four distinguishable forms respectively inhabiting Algeria, Tripoli, Lower Egypt, and Palestine. They are distinguished mainly by size and the relative development of their bullæ, their external appearance being all very much the same.

13. *PSAMMOMYS ROUDAIREI* Lat.

14. ♀. Bonjem. 20 April, 1901.

117. ♀. W. Wagis. 7 July, 1901.

I have always considered M. Lataste was unnecessarily hasty in withdrawing his name *Psammomys roudairei*, for there are clearly two species—a larger darker, and a smaller paler one—living together in Algeria and Tripoli; and, although undoubtedly immature, his two type specimens (of which the British Museum possesses one) evidently belong to the smaller form. The name itself would have stood in any case, for, as has already been seen, the large western *Psammomys* is different from *Ps. obesus*, and has not hitherto had a tenable name applied to it.

The second specimen above recorded is only doubtfully placed here, as it is immature, and members of this group are almost impossible of satisfactory determination unless fully adult.

14. *MUS MUSCULUS ORIENTALIS* Cr.

1. Tarhina. 5 April, 1901.

15. *ACOMYS VIATOR*, sp. n.

90. ♀. Wadi Sultan, near Sokna. 18/6/1.

Size fairly large. Spines of back about 11 mm. long, by barely half a millimetre broad. General colour above pale slaty grey anteriorly, changing to dull pale rufous posteriorly. Individually the dorsal spines are pale grey (near smoke-grey of Ridgway), with their extreme points dark brown, and with a narrow pale rufous subterminal band; under surface pure white throughout. Head and shoulders plain grey, the spines narrower and grey throughout, without darkened points. Ears rather small, pale greyish, a white spot below their outer base. Hands and feet white. Tail of medium length, greyish brown above, white below.

Skull smaller than in *A. dimidiatus*, the brain-case of medium size and its ridges not conspicuously heavy or broadened. Palatal foramina to the posterior third of  $m^1$ . Opening of posterior nares 2·3 mm. behind back of  $m^3$ . Bullæ smaller than in *A. dimidiatus*, their antero-external-postero-internal breadth 4·2 mm.

Dimensions of the type:—

Head and body 110 mm.; tail 107; hind foot 19·5; ear 19.

Skull—greatest length 29; basilar length 21·5; zygomatic breadth 14; nasals, length 11; interorbital breadth 4·6; breadth

<sup>1</sup> Ann. Mag. N. H. (7) ix. p. 363 (1902).

of brain-case 12·2; palate, length 13·5; diastema 7·4; palatal foramina 7; length of upper molar series 4·1.

*Habitat* and *Type* as given above.

This species is smaller and greyer than *A. dimidiatus*, paler and more rufous than *A. cahirinus*. It represents the most westerly recorded locality of the genus *Acomys* in Northern Africa.

Mr. Dodson tells me that these Spiny Mice, comparatively dark among their pallid neighbours, resemble the small blackish stones which lie about among the Soda Mountains, but were not elsewhere met with in the region traversed.

16. *JACULUS GERBOA* Oliv.

164. ♂. Sidi Faradje. 6/8/1.

17. *JACULUS JACULUS* L.

62. Attich Loumonileh.

118. 120. Oumsinerna. 10-12/7/1.

As usual, Jerboas are far less numerous in the collection than Gerbilles, and at present material does not exist for an exact comparison of Algerian, Tripolitan, and Egyptian specimens.

Mr. de Winton has pointed out to me that the names *Jaculus* for the genus and *Jaculidæ* for the family must stand instead of *Dipus* and *Dipodidæ*.

18. *CTENODACTYLUS VALI*, sp. n.

13. Wadi Bey. 19/4/1.

104. W. Titti, east of Sokna. 27/6/1.

External characters very much as in *C. gundi*. General colour approximately pinkish buff above, nearly white below, the hairs dull slaty basally. Face rather paler than body. Ears light cream-colour, their edges scarcely blackened. Upper surface of hands and feet and whole of tail pale cream-colour. Tail thin, shorter than the foot, its terminal hairs about 20 mm. in length.

Skull in general shape as in *C. gundi*, but with enormous bullæ, as in *Massoutiera mzabi*. Nasals long and narrow, little broadened in front. Anteorbital projections comparatively delicate. Interparietal of medium size, less broad than in *gundi*. Bullæ enormous, but the opening of the meatus is visible outside them in an upper view; anteriorly above they reach forward nearly to touch the well-developed postero-external projection of the zygomatic process of the squamosal; medially their anterior half extends on the upper surface to within 7 mm. of the middle line, and their posterior half to within 4·5 mm.; posteriorly they project far behind the occipital plane, which is only 7 mm. wide between them. Paroccipital processes comparatively small. Palatal foramina as in *C. gundi*. Posterior nares narrow, angular. Molars small and delicate, shorter antero-posteriorly than in *C. gundi*, the last molar less distinctly L-shaped than in that species, and to that extent marking a slight step towards the condition in *Massoutiera*.

Dimensions of the type:—

Head and body 187 mm.; tail 20; hind foot 34; ear 14.

Skull—greatest median length 47·5; basilar length 35·5; gnathion to most posterior point of bulla 49; zygomatic breadth 31; nasals  $18 \times 5·5$ ; interorbital breadth 12·2; interparietal  $8·8 \times 1·1$ ; diastema 11; palatal foramina  $8 \times 4$ ; upper molar series 8·2; greatest oblique diameter of bullæ below 18·1; greatest oblique diameter, as seen from above, nearly at right angles to last 17·2; vertical height of bullæ 17; height of lower jaw, from condyle, 10·5.

Typical locality. Wadi Bey, just northwest of Bonjem.

Type. Old female. No. 13. Killed 19 April, 1901.

This animal is the most distinct from its allies of all the species found by Mr. Dodson, and bearing in mind the fewness of the members of the *Ctenodactylinae*, the discovery of so well-marked a new form is a matter on which Mr. Whitaker may well be congratulated.

19. *LEPUS WHITAKERI*, sp. n. (Plate I.)

3. Wadi Sofedjin. 12/4/1.

61. Timinint. 17/5/1.

111. W. Agarib. 2/7/1.

A very handsome pinkish-buff Hare, quite distinct from all its allies.

Size medium. General colour a rich pinkish buff, richer and more pinkish than in *L. æthiopicus*, the species to which *L. whitakeri* has the greatest external resemblance. On the back the general colour is more or less lined with black, but on the forehead it is clear and rich, not greyer as is often the case. Nape rather deeper in colour, approaching "vinaceous buff" in the darkest specimen. Eyes with indistinct whitish rings, but scarcely a trace of the pre- and postorbital white patches present in *L. æthiopicus*. Ears long, buffy, the marginal hairs whitish buffy; back of tips rather browner, but no distinct terminal patch. Sides and chest rich pinkish buffy; chin and belly white, not sharply defined laterally. Limbs buffy, the inner side of the arms and thighs whitish; long hairs of palms and soles yellow or reddish. Tail black above, pure white on the sides and below.

"Irides yellow-ochre."

Skull not unlike that of *L. æthiopicus*, but rather narrower, and with less broadly expanded supraorbital wings. Enamel of incisors forming a simple angular notch, not penetrating deeply into the tooth, and not filled up with cement. In this last respect *L. whitakeri* agrees rather with the very differently coloured Algerian species than with *L. æthiopicus* and its allies.

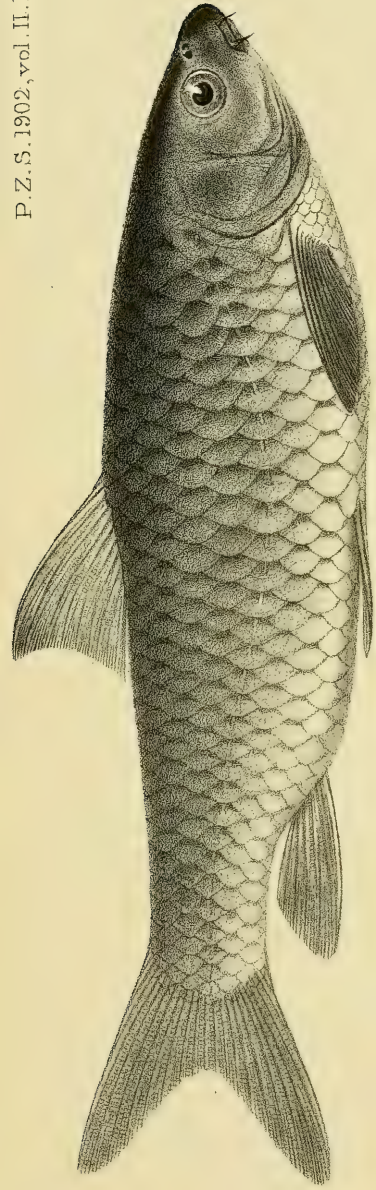
Dimensions of the type:—

Head and body 420 mm.; tail 70; hind foot 100; ear (measured dry) from crown 140, from notch 121.

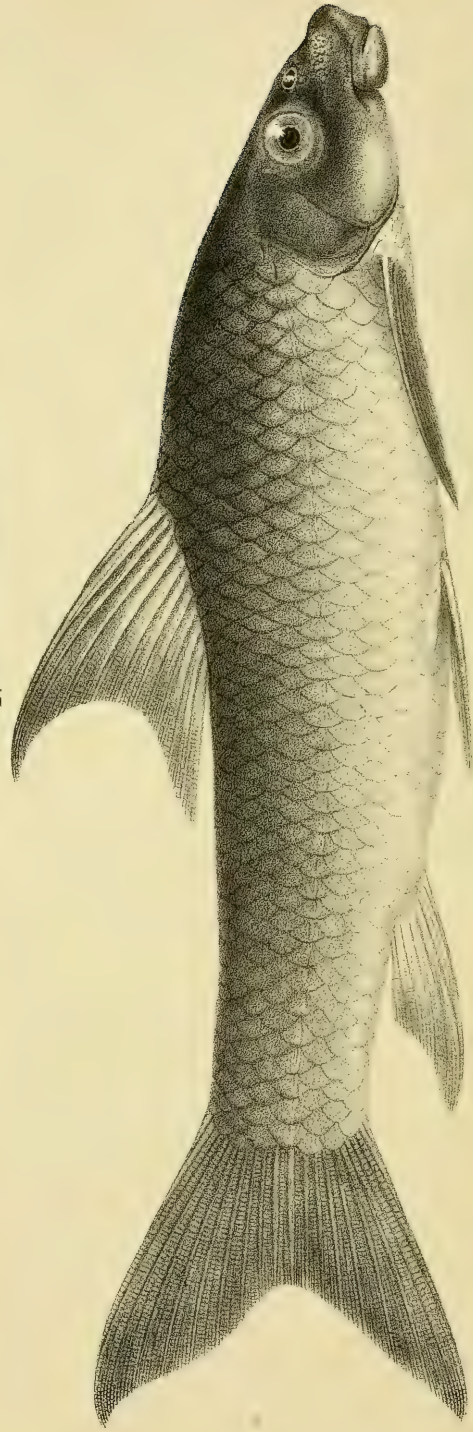
Skull—greatest length 83; basilar length 67; zygomatic breadth 38·5; nasals, oblique length 34, greatest breadth 17·5, least







2.



1.

Modern Bros. imp.

F. J. Smit del. et. lith.

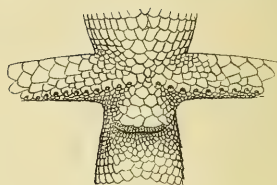
1. LABEO DARLINGI. 2. BARBUS RHODESIANUS.







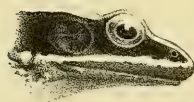
1.



2c.



2a.



1a.

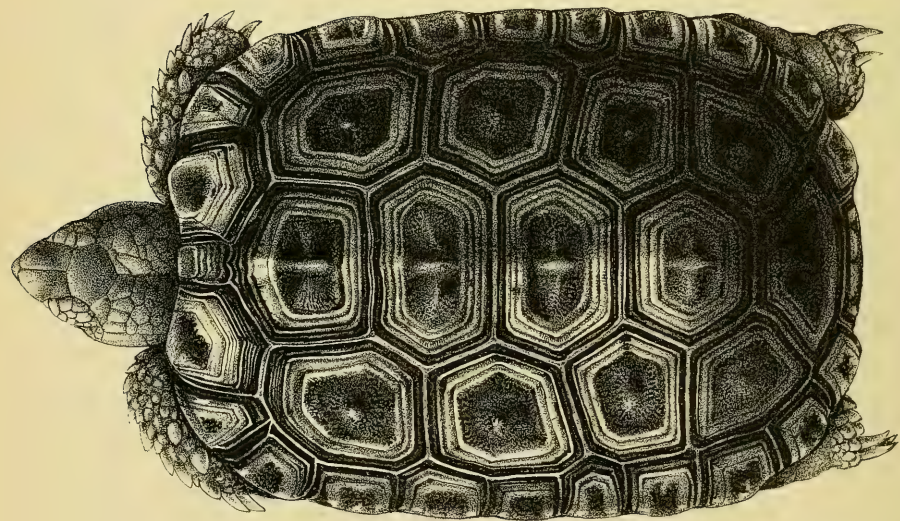


2b.

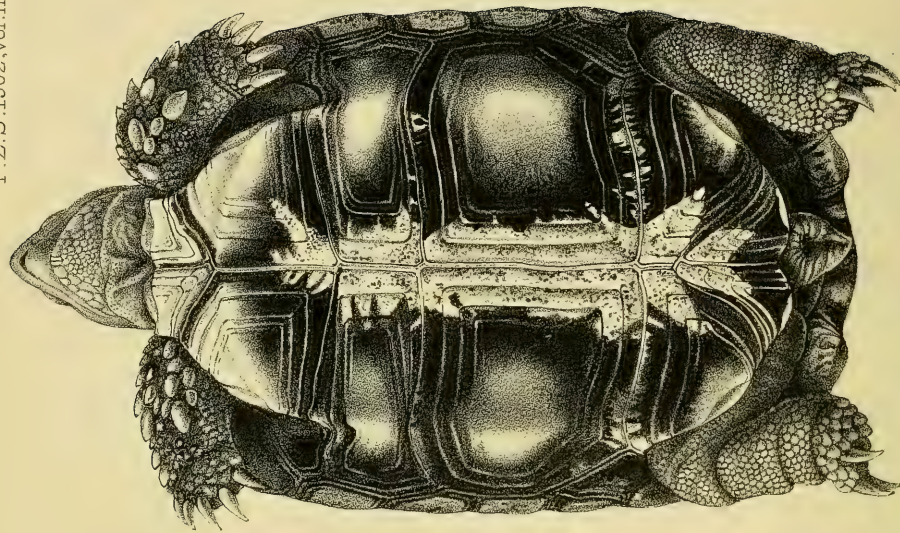


2.





J. Green del. et lith.



HOMOPUS DARLINGI.

breadth 11·5; interorbital breadth inside wings 17, between tips of wings 27; inter-temporal breadth 10·7; breadth of brain-case 27; posterior breadth between lips of meatus 35; diastema 24; palate length 29·5; palatal foramina  $21 \times 10$ ; length of cheek-tooth series (alveoli) 14·5; antero-posterior diameter of bulla 13.

Typical locality. Wadi Agarib, just N.W. of Sokna.

*Type*. Male. No. 111. Killed 2 July, 1901.

This fine Hare, which is named in honour of Mr. Whitaker, to whose enterprise and generosity the whole of the Tripoli collection is due, is readily distinguishable from all its allies by its remarkable colour and the character of its incisors.

This species seems widely distributed in Tripoli, from Wadi Sofedjin in the north, to Timinint, near Sebha, in the south.

20. GAZELLA DORCAS, L.

12. ♀. Erdeul. 18/4/1.

44. ♀. Linzerat. 7/5/1.

45. ♀. Oum el Abid. 11/5/1.

85. 86. 87. ♀ ♂ ♂. El Koshby. 15/6/1.

119. 136. 137. 3 ♀. Limhursuk. 15-16/7/1.

21. AMMOTRAGUS LERVIA Pall.

108. ♂. W. Agarib. 29/6/1.

EXPLANATION OF PLATE I.

*Lepus whitakeri*, p. 12.

2. A List of the Fishes, Batrachians, and Reptiles collected by Mr. J. folliott Darling in Mashonaland, with Descriptions of new Species. By G. A. BOULENGER, F.R.S.

[Received April 14th, 1902.]

(Plates II.-IV.<sup>1</sup>)

The fauna of Rhodesia is still so imperfectly worked out that all zoologists will feel grateful to Mr. Darling for the trouble he has taken in forming collections in the part of the country in which he has been residing for the past few years, viz. the district about Salisbury. The series of Fishes, Batrachians, and Reptiles, the names of which follow, was collected at Mazoë and between Umtali and Marandellas, and presented by him to the British Museum. Two Fishes, a Frog, a Tortoise, and a Lizard are new to science.

FISHES.

1. LABEO DARLINGI, sp. n. (Plate II. fig. 1.)

Body compressed, its depth nearly equal to the length of the head and contained 4 times in the total length. Head  $1\frac{1}{2}$  as long as

<sup>1</sup> For explanation of the Plates, see p. 18.



broad; snout rounded, strongly projecting beyond the mouth, with scars of small horny warts; eye perfectly lateral, in the middle of the head, its diameter  $4\frac{1}{2}$  times in the length of the head,  $2\frac{1}{4}$  in the width of the interorbital region, which is flat; width of mouth, with lips,  $\frac{2}{3}$  that of the head; rostral flap and anterior border of lip not denticulated; lower lip with a series of papillæ forming a denticulation; inner surface of lip with numerous transverse plicæ, formed of closely-set obtuse papillæ; a minute barbel, hidden in the folds at the side of the mouth. Dorsal II 10, with strongly notched upper border; the longest ray exceeds the length of the head; fin equally distant from the nostril and the root of the caudal. Anal II 5, longest ray nearly as long as the head and reaching the root of the caudal. Pectoral subfalciform, as long as the head, not reaching the base of the ventral. Ventral nearly reaching the vent, its first ray falling under the seventh of the dorsal. Caudal deeply forked. Caudal peduncle scarcely longer than deep. Scales  $36\frac{6\frac{1}{2}}{6\frac{1}{4}}$ ; 4 series between the lateral line and the root of the ventral, 16 round the caudal peduncle. Olive-brown above, whitish beneath; fins dark.

Total length 160 millim.

A single specimen.

Very closely allied to *L. cylindricus* Peters, from the Zambesi, but body strongly compressed, eye occupying the middle of the head, and one scale more in the transverse series above the lateral line.

## 2. BARBUS TRIMACULATUS Peters.

### 3. BARBUS RHODESIANUS, sp. n. (Plate II. fig. 2.)

Depth of body  $3\frac{1}{2}$  to  $3\frac{2}{3}$  times in the total length, length of head 4 to  $4\frac{2}{3}$  times. Snout rounded, feebly projecting beyond the mouth,  $\frac{1}{3}$  the length of the head; diameter of the eye  $3\frac{2}{3}$  to  $4\frac{1}{2}$  times in the length of the head,  $1\frac{1}{2}$  to  $1\frac{2}{3}$  in the interocular width; mouth rather small, its width half that of the head, with thin lips, with two pairs of subequal barbels measuring about half the diameter of the eye. Dorsal III 8-9, third ray not at all enlarged, smooth; the fin, which is equally distant from the eye and the root of the caudal, has the free edge notched and its longest ray measures  $\frac{3}{4}$  to  $\frac{1}{5}$  the length of the head. Anal II 5; the longest ray measures  $\frac{3}{4}$  to  $\frac{5}{8}$  the length of the head and nearly reaches the root of the caudal when folded. Pectoral a little shorter than the head, not reaching the ventral, the first ray of which falls below the anterior third of the dorsal. Caudal forked. Caudal peduncle about  $1\frac{1}{2}$  as long as deep. Scales  $30-32\frac{5\frac{1}{2}}{5\frac{1}{2}}$ ,  $2\frac{1}{2}$  or 3 between the lateral line and the root of the ventral, 12 round the caudal peduncle. Dark olive-brown above, silvery below; fins dark.

Four specimens, measuring from 117 to 280 millim.

Allied to *B. marequensis* Smith, *B. altianalis* Blgr., and *B. bowkeri* Blgr. Differs from all three in the shorter barbels and

fewer scales in the lateral line; also from the first two by the weak third simple dorsal ray, and from the third in the smaller mouth with thinner lips.

4. *CLARIAS GARIEPINUS* Smith.

BATRACHIANS.

1. *XENOPUS LEVIS* Daud.

2. *BUFO REGULARIS* Reuss.

3. *BREVICEPS MOSSAMBICUS* Peters.

4. *RANA ADSPERSA* Bibr.

5. *RANA ANGOLENSIS* Bocage.

6. *RANA DARLINGI*, sp. n. (Plate III. fig. 1.)

Vomerine teeth in two slightly oblique, oval groups close together, just behind the level of the choanæ. Head moderate, depressed; snout as long as the diameter of the orbit, obtusely acuminate, projecting; nostril a little nearer the end of the snout than the eye; loreal region slightly concave; interorbital space a little narrower than the upper eyelid; tympanum very distinct, nearly as large as the eye. Fingers and toes moderate, with blunt tips; first finger extending a little beyond second; toes two-thirds webbed; subarticular tubercles small; a small oval inner metatarsal tubercle and a very indistinct, round outer one. The tibio-tarsal articulation reaches between the eye and the tip of the snout. Skin smooth; no distinct dorso-lateral fold. Pale grey above, black on the sides, the limit between the two shades sharply defined; a white labial streak from the tip of the snout to the arm; limbs freckled and spotted with dark brown; throat and breast grey-brown, belly marbled with grey-brown.

From snout to vent 53 millim.

Two female specimens.

7. *PHRYNOBATRACHUS NATALENSIS* Smith.

8. *RAPPIA MARMORATA* Rapp.

REPTILES.

1. *STERNOTHERUS SINUATUS* Smith.

2. *HOMOPUS DARLINGI*, sp. n. (Plate IV.)

Shell depressed, more than twice as long as deep, of subequal depth throughout, posterior margin feebly serrated; dorsal shields not swollen, with deep concentric grooves; a moderate-sized nuchal; vertebral shields broader than long, as broad as or a little broader than the costals; anterior plastral lobe truncate and  $\frac{2}{3}$  the width of the bridge, posterior slightly notched and about  $\frac{1}{2}$  that width; suture between the abdominal shields

longest, between femorals shortest; gular shields smaller than anals; axillary and inguinal shields rather large. Beak scarcely hooked; a large frontal and a pair of præfrontal shields. Fore limbs with moderately large imbricate scales of very unequal size, the largest raised and nail-like; no enlarged tubercles on the back of the thighs; fore limb with five claws, hind limb with four. Carapace black, each shield with a yellowish-brown areola; plastron black and yellow, with a median yellowish marking with dentate borders and speckled with olive-grey; head and limbs dark olive, the horny sheath of the jaws, the claws, and the larger scales on the fore limbs yellowish.

Length of carapace 93 millim.

A single female specimen.

This very distinct species is most nearly related to *H. signatus* Walb., from which it differs, apart from the coloration, in the large frontal shield and the absence of a large conical tubercle on the back of the thigh.

### 3. *LYGODACTYLUS CAPENSIS* Smith.

### 4. *PACHYDACTYLUS AFFINIS* Blgr.

Several specimens, from between Umtali and Marandellas, enable me to supplement the description of this Gecko given in 1896<sup>1</sup> from a single specimen obtained in the Rustenberg district of the Transvaal.

Naso-rostrals in contact; 8 to 10 upper labials; 7 lower labials. Tail feebly depressed, tapering to a fine point, covered with equal smooth scales, which are hexagonal and juxtaposed on the upper surface, roundish and subimbricate on the lower surface. Pale brown above, with round blackish spots intermixed with smaller round white spots; a blackish streak on each side of the head, passing through the eye; lower parts white.

Total length .....	90 millim.	Fore limb .....	13 millim.
Head .....	12   ,,	Hind limb .....	17   ,,
Width of head ...	9   ,,	Tail .....	45   ,,
Body .....	33   ,,		

### 5. *AGAMA ACULEATA* Merr.

### 6. *AGAMA KIRKI* Blgr.

### 7. *AGAMA ATRICOLLIS* Smith.

### 8. *PLATYSAURUS GUTTATUS* Smith,

A male specimen, measuring 110 millim. from snout to vent, tail 170. Differs from the type in having the fronto-nasal forming a short suture with the rostral, separating the nasals, and in the absence of a shield between the interparietal and the occipital, which are in contact with each other. 18 femoral pores

<sup>1</sup> Ann. & Mag. N. H. (6) xvii. 1896, p. 21.

on each side. Back dark grey, with lighter dots; limbs and belly black; tail orange.

9. *ICHNOTROPIS LONGIPES*, sp. n. (Plate III. fig. 2.)

Closely allied to *I. capensis* Smith, with which it entirely agrees in the scaling, but body shorter and limbs longer, the hind limb, if pressed against the body, reaching between the ear and the eye. Foot much longer than the head. 36 to 40 scales round the middle of the body. 9 or 10 femoral pores on each side. Pale grey-brown above, tinged with orange on the sides of the back, which is unspotted; a black streak along each side, from the tip of the snout, through the eye, to the anterior fourth of the tail; a second black streak along the upper lip, extending to the shoulder and separated from the upper one by a white streak; some large black spots on the hind limbs; lower parts white.

Total length .....	160 millim.	From end of snout	
Head .....	13 "	to vent.....?	49 millim.
Width of head ...	8 "	Fore limb .....	19 "
From end of snout		Hind limb .....	33 "
to fore limb.....	21 "	Tail .....	111 "

This new Lizard is represented by three male specimens.

10. *GERRHOSAURUS FLAVIGULARIS* Wiegman.

11. *MABUIA QUINQUETÆNIATA* Licht.

12. *MABUIA VARIA* Peters.

13. *MABUIA STRIATA* Peters.

14. *LYGOSOMA SUNDEVALLI* Smith.

15. *ACONTIAS MELEAGRIS* L.

16. *CHAMÆLEON DILEPIS* Leach.

17. *TYPHLOPS SCHLEGELI* Bianc.

18. *TYPHLOPS MUCRUSO* Peters.

19. *GLAUCONIA NIGRICANS* Schleg.

20. *BOODON LINEATUS* D. & B.

21. *PSEUDASPIS CANA* L.

22. *CHLOROPHIS NATALENSIS* Smith.

23. *PHILOTHAMNUS SEMIVARIEGATUS* Smith.

24. *PROSYMNA AMBIGUA* Bocage.

25. *DASYPELTIS SCABRA* L.

26. *TRIMERORHINUS TRITÆNIATUS* Gthr.

## 27. PSAMMOPHIS SIBILANS L.

Uniform olive-brown above, down to the ends of the ventral shields, which are unspotted; lips yellowish, spotted with olive-brown.

## 28. DISPHOLIDUS TYPUS Smith.

## 29. APARALLACTUS CAPENSIS Smith.

## 30. APARALLACTUS GUENTHERI Blgr.

## 31. NAIA HAIE L.

A perfectly typical young specimen, with 21 scales across the neck, 19 across the body, 190 ventrals, and 60 caudals. Neck black, body brown above with indistinct darker spots, yellowish beneath. A large specimen from Salisbury, presented by Col. Rhodes some years ago, answers to Peters's var. *annulifera*.

## 32. NAIA NIGRICOLLIS Reinh.

## 33. CAUSUS RHOMBEATUS L.

## 34. CAUSUS DEFILIPPPI Jan.

## 35. BITIS ARIETANS L.

## EXPLANATION OF THE PLATES.

## PLATE II.

Fig. 1. *Labeo darlingi*, p. 13, natural size.

2. *Barbus rhodesianus*, p. 14, reduced  $\frac{1}{2}$ .

## PLATE III.

Fig. 1. *Rana darlingi*, p. 15, natural size.

1 a. " " Side-view of head, natural size.

2. *Ichnotropis longipes*, p. 17, natural size.

2 a. " " Upper view of head,  $\times 1\frac{3}{4}$ .

2 b. " " Side-view of head,  $\times 1\frac{3}{4}$ .

2 c. " " Anal region,  $\times 1\frac{3}{4}$ .

## PLATE IV.

*Homopus darlingi*, p. 15, natural size, upper and lower views.

3. On the Ornithological Researches of M. Jean Kalinowski in Central Peru. By Graf HANS VON BERLEPSCH and JEAN STOLZMANN.

PART II. (continued from P. Z. S. 1896, p. 388.)

[Received March 26, 1902.]

Nous continuons ici notre rapport sur les résultats des investigations ornithologiques de M. Jean Kalinowski au Pérou (1890-93), dont la première partie a été lue devant la Société en mars 1896.



## Fam. TROCHILIDÆ.

## 295. DORYFERA LUDOVICÆ (Bourc. et Muls.).

? *D. rectirostris* Tacz. Orn. du Pérou, i. p. 284.

La Garita del Sol : un mâle adulte, 5 juillet 1891.

Al. 63, caud. 35, culm. 32 mm.

L'oiseau envoyé est tout-à-fait identique aux échantillons de Bogotá, il a seulement le bec un peu plus court que la majorité des oiseaux colombiens.

## + 296. PHAËTHORNIS GAYI EMILIÆ (Bourc. et Muls.).

*Ph. emiliæ* Tacz. Orn. du Pérou, i. p. 268.

La Gloria : deux mâles et une femelle d'août 1890 et de janvier et février 1891.

Les individus du Pérou central s'accordent bien en général avec les oiseaux typiques de Bogotá, si ce n'est peut-être qu'ils ont les ailes un peu plus courtes et le dos plus obscur (moins luisant), la mandibule inférieure plus distinctement terminée de noirâtre.

## + 297. PHAËTHORNIS RUFIGASTER LONGIPENNIS, subsp. nov.

*Ph. Ph. rufigaster* (Vieill.) dicto ex *Brasilia simillimus*, differt alis multo longioribus.

♀ ♀. Al.  $43\frac{3}{4}$ – $41\frac{1}{2}$ , rectr. med.  $34\frac{3}{4}$ – $33\frac{3}{4}$ , submed. 27, extern.  $15\frac{1}{2}$ , culm.  $21\frac{3}{4}$ – $20\frac{3}{4}$ , caud. graduata 19– $18\frac{1}{2}$  mm.

*Hab.* in Peruvia centrali or. : Chanchamayo.

*Typus* in Mus. Branicki.

La Merced : une femelle du 21 août 1890. Borgoña : une femelle du 23 mai 1891. "Iris noir, bec noir à moitié basale de la mandibule inférieure jaune de cire, pattes d'un jaune de cire."

Quant à leur coloration, les oiseaux de Chanchamayo s'accordent parfaitement avec les oiseaux du Brésil (*Ph. rufigaster*). Ils s'en distinguent néanmoins par les ailes beaucoup plus longues. La longueur de l'aile est de  $41\frac{1}{2}$  à  $42\frac{3}{4}$  mm., tandis qu'elle est de 34 à 37 mm. chez une vingtaine d'individus du *Ph. rufigaster* du Brésil mesurés par Berlepsch. Il n'y a pas d'autres différences et les relations de cette forme du Pérou central sont évidemment avec le *Ph. rufigaster* et non avec le *Ph. nigricinctus* Lawr. de l'Amazone supérieur, qui a la mandibule inférieure presque entièrement blanche, tandis que nos oiseaux présentent la moitié terminale de la mandibule noirâtre comme chez le *Ph. rufigaster*. Les pointes des rectrices médianes sont rousses comme chez cette dernière espèce et non blanches comme chez le *Ph. stuarti* Hartert de la Bolivie.

## + 298. EUTOXERES CONDAMINEI GRACILIS, subsp. nov.

*E. condaminei* Tacz. Orn. du Pérou, i. p. 259 (Pérou centr.).

*E. E. condaminei* dicto *simillimus*, differt rostro multo brevior et graciliore, alis quoque brevioribus, necnon striis fulvescentibus

*gulae pectorisque multo latioribus, dorso magis aeneo-viridi et tectricibus caudae inferioribus minus caerulecente lavatis.*

♂. Al.  $74\frac{1}{2}$ , caud.  $59\frac{1}{2}$ , culm.  $29\frac{1}{4}$  mm.  
 ♀. „ 65, „  $47\frac{1}{2}$ , „  $29\frac{1}{2}$  „

*Hab.* in Peruvia centrali: Vitoc.

*Typus* in Mus. Branicki.

Vitoc, Garita del Sol: un mâle adulte du 24 mars 1893 et une femelle du 17 août 1891. “Iris noir; bec noir, corné, à mandibule inférieure d'un jaune olivâtre à la base, pattes d'un brun jaunâtre.”

Les deux oiseaux recueillis par M. Kalinowski, dont le mâle paraît tout-à-fait adulte, tandis que l'oiseau marqué femelle est peut-être jeune, diffèrent des échantillons de l'*E. condaminei* de l'Ecuador par le bec beaucoup plus court, plus faible et plus courbé, les ailes également plus courtes. Quant à la coloration, les oiseaux péruviens diffèrent par les stries fauves de la gorge et de la poitrine plus larges et plus claires (blanchâtres sur la poitrine), par le dos d'un vert plus jaunâtre ou plus doré, les tectrices souscaudales moins lavés de bleuâtre, les rectrices médianes d'un vert plus vif et demi-luisant au lieu d'un vert noirâtre, enfin par les rectrices externes d'un cannellé plus pâle.

### 299. PATAGONA GIGAS (Vieill.).

Acobamba: une femelle du 20 septembre 1890; une autre de Tarma du 7 août 1893.

### 300. LEUCIPPUS CHIONOGASTER (Tsch.).

La Merced: trois mâles de juillet et septembre 1890. Garita del Sol: trois femelles de juin, juillet et août 1891.

### 301. AGYRTRIA BARTLETTI (Gould).

La Merced: cinq mâles de juillet et août 1890, un mâle et deux femelles de janvier et février 1891. “Bec et pattes noirs, mandibule inférieure d'un carné-rosâtre dans sa moitié basale.”

Il n'y a pas de différence entre ces oiseaux et les individus de l'Ucayali recueillis par M. G. Garlepp (Mus. Berlepsch).

### 302. CHRYSURONIA JOSEPHINÆ (Bourc. et Muls.).

La Merced, Quimiri: un mâle adulte.

Al.  $55\frac{1}{4}$ , caud. 35, culm.  $17\frac{1}{2}$  mm.

Ce mâle tout-à-fait adulte diffère des individus de Huambo et de Rioja (Pérou du nord) par le bec plus court, le violet de la tête plus brillant, plus rougeâtre et plus prolongé jusqu'à la nuque, enfin par le manque d'une tache bleue bien marquée sur le menton. Il n'y a que deux petites plumes bleues-violettes et une petite raie bleue-violette en forme de moustache sur chaque côté de la gorge.

### 303. CHLOROSTILBON PRASINUS DAPHNE Gould.

*Chl. prasinus* Tacz. Orn. du Pérou, i. p. 414.

La Merced : trois mâles de juillet et août 1890. Borgoña : un mâle du 8 juin 1891. Garita del Sol : un mâle du 3 septembre 1891.

Le type du *Chl. daphne* Gld. venait des Pampas del Sacramento, région pas trop éloignée de Chanchamayo. Cette forme diffère du *Chl. prasinus* typique du Brésil par le bec, les ailes et la queue plus longs, la queue légèrement échancrée au lieu d'être parfaitement arrondie, enfin par les côtés de la gorge moins dorés.

#### 304. THALURANIA JELSKII Tacz.

La Gloria et La Merced : un mâle et trois femelles d'août et septembre 1890. La Gloria, janvier 1891, et Borgoña, mai 1891 : quatre mâles.

♂ ad.	Al.	61 $\frac{1}{2}$ ,	caud.	45 $\frac{1}{2}$ ,	culm.	19 $\frac{3}{4}$ ,	caud. furca	14 $\frac{3}{4}$ mm.
♀ jr.	"	58 $\frac{1}{4}$ ,	"	38 $\frac{1}{2}$ ,	"	19 $\frac{3}{4}$ ,	"	11 $\frac{1}{2}$ "
♀ et ♂	"	55-54 $\frac{1}{2}$ ,	"	33 $\frac{1}{2}$ -32,	"	21-19 $\frac{3}{4}$ ,	"	3 $\frac{1}{2}$ -1 $\frac{3}{4}$ "
juv.								

L'oiseau typique mesuré par feu Taczanowski, qui se trouve au Musée de l'Université de Varsovie, doit être un mâle encore incomplètement développé, car les mâles adultes recueillis par M. Kalinowski ont les dimensions beaucoup plus grandes et sous ce rapport surpassent même les adultes de la *Th. nigrofasciata* (Gld.).

La *Th. jelskii* qui habite aussi la Bolivie, d'où Berlepsch a reçu un grand nombre d'exemplaires recueillis par M. G. Garlepp, se distingue principalement des espèces voisines *Th. nigrofasciata* et *Th. tschudii* par la forme de la plaque verte métallique de la gorge coupée en dessous presque en ligne droite, tandis que chez les deux autres espèces que nous venons de nommer ce vert se prolonge en se rétrécissant jusqu'au milieu de la poitrine, où il prend une nuance bleu-verdâtre chez la *Th. tschudii*.

#### 305. COLIBRIS IOLATUS (Gld.).

*Petasophora anais* Tacz. Orn. du Pérou, i. p. 367.

La Merced : quatre jeunes mâles de juillet et août 1890. La Garita : un mâle adulte et deux femelles des 30 juin, 4 et 23 juillet 1891. Tarma : un mâle adulte et deux femelles du 15 décembre 1890. Tapo : deux mâles du 27 décembre 1892.

Ces échantillons ne diffèrent des oiseaux typiques de la Bolivie que par le bec généralement un peu plus court et peut-être par les souscaudales moins variées de blanchâtre. Les individus de Bogotá et de l'Ecuador ont le bec et les ailes généralement plus courts que ceux de la Bolivie. Les oiseaux des environs de Cuzco (coll. O. Garlepp) s'accordent tout-à-fait avec les boliviens. Il serait difficile de constituer une sous-espèce, car les oiseaux de Pérou central quant à la longueur des ailes s'accordent avec les boliviens, et ne diffèrent que par leur bec généralement plus court.

#### + 306. COLIBRIS CYANOTUS (Bourc. et Muls.).

*Petasophora cyanotis* Tacz. Orn. du Pérou, i. p. 369.

Maraynioc, Culumachay : un mâle en plumage très-usé du 24 juillet et un autre du 24 août 1892.

4- 307. *LAMPORNIS NIGRICOLLIS* (Vieill.).

*Lampornis violicauda* Tacz. Orn. du Pérou, i. p. 281.

La Merced : une mâle adulte du 23 juillet 1890.

S'accorde avec les individus de Paraguay et du Brésil du Musée Berlepsch.

308. *OREOTROCHILUS MELANOGASTER* Gld.

Ingapirca : un jeune mâle de mai 1890. Tarma, Hacienda da Queta : femelles du 1 septembre et de décembre 1893.

309. *PHÆOLĒMA CERVINIGULARIS* Salv. ?

"*Phæolēma æquatorialis*?" Tacz. P. Z. S. 1882, p. 35.

*Phæolēma æquatorialis* Tacz. Orn. du Pérou, i. p. 292.

Chanchamayo; La Garita : deux femelles du 14 juillet 1890 et du 29 juin 1891.

Al. 71, 69; caud.  $44\frac{3}{4}$ , 41; culm.  $24\frac{1}{2}$ ,  $22\frac{3}{4}$ ; caudæ furca  $7\frac{1}{2}$  mm.

Ces femelles s'accordent avec une femelle de Rayurmana, Pérou du nord (coll. Stolzmann), en possédant une gemme améthyste sur la gorge, qui manque aux femelles de la *Ph. rubinoides* et de la *Ph. æquatorialis*.

Nous ne doutons pas que la femelle de Rayurmana appartienne à la *Ph. cervinigularis*, car elle présente une ligne de plumes écailleuses luisantes prolongée du front jusqu'au milieu du vertex. Les femelles de Chanchamayo et de Garita ne présentent qu'une petite marque de plumes luisantes au front, non prolongée jusqu'au piléum. Il faudra donc attendre les mâles adultes du Pérou central pour voir s'ils diffèrent peut-être dans ce même caractère des mâles de la *Ph. cervinigularis* Salv. de l'Écuador.

310. *LAMPRASTER BRANICKII* Tacz.

La Gloria : deux mâles adultes du 6 août 1890 et du 18 janvier 1891.

Al.  $67\frac{1}{2}$ , caud. 41, culm.  $20\frac{3}{4}$ , caud. furca 7 mm.

Les oiseaux recueillis par M. Kalinowski, dont l'un orne le Muséum Branicki, l'autre le Muséum Berlepsch, s'accordent avec l'oiseau typique de Monterico du Muséum de Varsovie. Ces trois échantillons sont jusqu'à présent les seuls représentants de cette belle espèce dans les collections scientifiques.

Malheureusement nous n'avons pas d'individus de l'*Aphantochroa gularis* Gld. à comparer; mais, pour autant que nous pouvons juger d'après les descriptions et la figure dans l'ouvrage de M. Gould, ces deux espèces paraissent alliées ou peut-être congénériques. Comme il paraît, le *L. branickii* diffère de l'*A. gularis* par le bec plus court et droit au lieu d'être courbé, par le noir uniforme des rectrices externes, par la présence des plumes écailleuses au front, par le roux des rémiges secondaires, enfin par



la gemme de la gorge d'un rouge de feu au lieu d'un rosé-lilas. Toutes les deux ont les tectrices souscaudales d'un blanc pur.

+ 311. *HELIODOXA LEADBEATERI* (Bourc.).

*Heliodoxa otero* Tacz. Orn. du Pérou, i. p. 287.

Garita del Sol : un mâle adulte et deux jeunes mâles de juin et d'août 1891, une femelle du 22 juillet 1891, et un mâle adulte du 1 avril 1893. "Iris et bec noirs, pattes brunes."

312. *HELIANTHEA DICHROURA* Tacz.

Maraynioc : trois mâles et deux femelles d'octobre, novembre et décembre 1891, et deux mâles ad. de Pariayacu de février et juin 1893. "Bec noir, pattes d'un carné-brunâtre."

♂. Al. 86, caud.  $55\frac{1}{2}$ , culm.  $33\frac{1}{2}$ , caud. furca  $6\frac{1}{2}$  mm.  
♀. " 79, " 50, " 35, "  $6\frac{1}{2}$  "

Espèce bien distincte de la *H. osculans* Gld., du Pérou du sud. Des échantillons recueillis par M. O. T. Baron dans le Pérou du nord oriental s'accordent avec les individus typiques de Maraynioc.

313. *BOURCIERIA INSECTIVORA* (Tsch.).

Maraynioc : mâles adultes du 3 novembre 1892 ; Tuyas yacu : un oiseau sans indication de sexe (femelle ?) du 17 août 1892, mâles et femelles de mars et avril 1893.

♂. Al. 79, caud. 49, culm. 31 mm.  
♀. " 74, " 45, "  $33\frac{1}{2}$  "

Un mâle adulte de Huambo (Pérou nord-est) diffère par la gemme frontale plus grande et plus bleuâtre, par la plaque métallique du piléum plus bleuâtre, par le vert de la gorge plus bleuâtre, par le dos moins noirâtre dans sa partie supérieure, d'un vert plus bleuâtre dans la partie inférieure, enfin par la partie terminale verdâtre des rectrices externes plus courte et plus pâle. L'oiseau typique de Tschudi venait du chemin de Huari à Chagacancha (14,600 pieds).

+ 314. *LAMPROPYGIA COLUMBIANA OBSCURA*, subsp. nov.

*Bourcieria coligena* Tacz. (nec Less.) Orn. du Pérou, i. p. 390.

*L. L. columbiana* Elliot dicta simillima, sed corpore supra sub-tusque obscuriore, gulae plumis sordidius albis et maculis fuscis majoribus instructis distinguenda.

♂. Al. 79, caud.  $53\frac{1}{2}$ , culm.  $31\frac{1}{2}$ , caud. furca 13 mm.  
♀. "  $70\frac{1}{2}$ , " 46, "  $30\frac{1}{4}$ , " " 8 "

*Hab.* in Peruvia centrali : Vitoc (coll. T. Kalinowski). Typus in Mus. Branicki, no. 2860 a.

Une paire de Garita del Sol, juillet 1891.

Les oiseaux du Pérou central diffèrent des oiseaux typiques de Bogotà par le plumage plus foncé en dessus et en dessous, la tête et le dos plus noirâtres, moins bronzés, l'abdomen plus noirâtre,



moins roussâtre, enfin par le fond de la gorge d'un blanc plus terne et plus grisâtre, à taches foncées plus larges. Ils ne ressemblent pas à la *L. cœligena* Less. du Vénézuëla que nous croyons d'espèce bien distincte.

† 315. LAFRESNAYEA SAUL RECTIROSTRIS, subsp. nov.

*L. gayi* (part.) Tacz. Orn. du Pérou, i. p. 283.

*L. L. saul* (Bourc.) dictæ ex Ecuador et Venezuela affinis, differt rostro brevior et rectior, alis caudaque vero longioribus, necnon colore gulæ pectorisque maris pallidior, magis aureo-viridi.

♂. Al. 67, caud.  $42\frac{1}{2}$ , culm.  $22\frac{1}{2}$  mm.

Hab. in Peruvia centrali: Maraynioc (coll. Kalinowski). Typus in Mus. Branicki.

Maraynioc: mâle adulte du 16 décembre 1891; et Pariayacu: jeune mâle du 4 juillet 1892.

L'oiseau envoyé diffère de tous le mâles du Vénézuëla, de l'Ecuador et d'un mâle de Cutervo, Pérou du nord (coll. Stolzmann), avec lesquels nous l'avons comparé, par le bec un peu plus court et presque rectiligne au lieu d'être sensiblement courbé, par les ailes et la queue au contraire plus longues. Le vert de la gorge, de la poitrine et des côtés du corps est plus clair et plus doré et le noir du milieu de l'abdomen est moins développé; la queue est un peu plus étagée.

316. DOCIMASTES ENSIFER (Boiss.).

*Docimastes ensiferus* Tacz. Orn. du Pérou, i. p. 375.

Maraynioc: deux mâles adultes de novembre et décembre 1891. Pariayacu: deux femelles de juillet 1892 et de juin 1893.

Al.  $79\frac{1}{2}$ , caud.  $62\frac{1}{2}$ , culm.  $83\frac{1}{2}$ , caud. furca  $25\frac{3}{4}$  mm.

Ces oiseaux diffèrent des oiseaux typiques de Bogotâ que par le bec un peu plus long, par le vert de la poitrine généralement d'une nuance plus bleuâtre, enfin par le milieu du ventre d'une couleur plus grisâtre, moins brunâtre. Néanmoins quelques individus de Bogotâ paraissent très proches et il faudrait un plus grand nombre d'individus pour être sûr qu'il n'existe pas quelques petites différences constantes.

317. PTEROPHANES TEMMINCKI (Boiss.).

Maraynioc: trois mâles de juillet et novembre 1891. Pariayacu: une femelle du 2 août 1892.

Un mâle adulte recueilli par M. Jelski à Maraynioc le 3 juin 1871 (du Musée Berlepsch) diffère des oiseaux de Bogotâ et de l'Ecuador (Quito) par le plumage, en dessus et en dessous, beaucoup plus sombre ou d'un vert plus noirâtre, par les tectrices souscaudales bleuâtres, par le bec, les ailes et la queue plus longs, la queue plus étagée. Un oiseau de la Bolivie pas tout-à-fait adulte s'accorde avec les oiseaux de la Colombie.

318. *AGLÆACTIS CAUMATONOTA* Gould.

Maraynioc: deux mâles adultes de juillet, du 15 décembre 1891, et du 18 janvier 1893. Pariayacu: un mâle du 28 janvier 1893. "Iris noir, bec et pattes noirs, mandibule inférieure d'un carné jaunâtre à la base."

Al.  $88-87\frac{1}{4}$ , caud.  $51\frac{1}{2}-49\frac{1}{2}$ , culm.  $16\frac{3}{4}-16\frac{1}{2}$ , caud. furca  $8\frac{1}{2}-7\frac{1}{2}$  mm.

Nos oiseaux s'accordent le mieux avec la description de l'*A. olivaceocauda* Lawr. (type de Matara, province d'Ayacucho). Le type de l'*A. caumatonota* Gld. est un jeune oiseau dont l'habitat était donné simplement comme "le Pérou." Probablement il n'y a pas lieu d'établir deux formes de cette espèce.

319. *BOISSONNEAU MATHEWSI* (Bourc.).

Garita del Sol: deux mâles, une femelle et un jeune d'août 1891. Culumachay: un mâle du 10 août 1892.

Il ne nous semble pas y avoir de différence constante entre les oiseaux du Pérou central, du Pérou du nord (localité typique) et de l'Ecuador.

320. *ERIOCNEMIS SAPHIROPYGIA* Tacz.

Maraynioc: deux mâles adultes du 17 décembre 1891. Pariayacu: une femelle du 18 septembre 1892. "Bec et pattes noirs."

Al. 72, caud. 48, culm. 20, caud. furca 15 mm.

Cette espèce est alliée à l'*E. luciani*, mais diffère par le manque complet du bleu au front, par le piléum légèrement bronzé, par les côtés du cou moins dorés, par la queue moins fourchue, etc.

321. *SPATHURA ANNÆ* Berl. et Stolzm.

*Spathura annæ* Berl. et Stolzm. Ibis, 1894, p. 398, descr. orig  
*S. peruana* Tacz. (nec Gould) Orn. du Pérou, i. p. 327.

La Gloria, Chanchamayo, Garita del Sol, Vitoc: deux mâles adultes, une femelle adulte et trois jeunes mâles de février, juin, juillet et novembre 1891. "Iris noir, bec noir, pattes carnées."

Depuis la publication dans l'Ibis, Berlepsch a réuni une bonne série d'individus de la *S. annæ* de la Bolivie et a pu s'assurer que les points de distinction indiqués dans notre article (*l. c.*) sont tout-à-fait fondés et constants. En effet les mâles adultes de la *S. annæ* se distinguent au premier coup d'œil par le manque complet du blanc à la base des plumes du cou inférieur et de la poitrine, le manque du mélange blanc-grisâtre au ventre, les tectrices souscaudales d'un vert uniforme sans bordures blanches-roussâtres, les rectrices externes généralement plus longues, enfin les spatules plus petites.

322. *ADELOMYIA MELANOGENYS* (Fras.).

Une paire de la Garita del Sol des 1 et 20 juillet 1891.

♂. Al.  $54\frac{1}{2}$ , caud.  $37\frac{1}{2}$ , culm. 14 mm.

♀. " 48, "  $31\frac{1}{2}$ , " 14 "

Ces oiseaux s'accordent avec une mâle de Huasampilla (coll. Whitely) du Musée Berlepsch (*A. chlorospila* Gld.), et diffèrent un peu des oiseaux de Bogotá par les parties inférieures et les points des rectrices externes plus roussâtres, moins blanchâtres et par les taches gulaires plus larges et d'un vert plus clair moins brunâtre. Néanmoins quelques individus de Bogotá sont tellement proches des oiseaux du Pérou central qu'il serait difficile de les en distinguer.

### 323. HELIANGELUS AMETHYSTICOLLIS (Lafr. et d'Orb.).

Maraynioc: une paire d'oiseaux du 17 décembre 1891, et quatre paires de juillet, août et octobre 1892, et de janvier et juin 1893. "Bec et pattes noirs."

Les mâles envoyés diffèrent des mâles de la Bolivie par le bec plus court, la bande pectorale d'un roussâtre plus pâle ou plus blanchâtre et le milieu de l'abdomen moins roussâtre, le croupion sans éclat cuivres. Les femelles diffèrent aussi des femelles de la Bolivie par la bande pectorale plus blanchâtre et la gorge d'un roux plus clair (au lieu d'un brun obscur), le milieu du ventre d'un fauve grisâtre au lieu d'un roux clair, ainsi que par le bec plus court.

Deux mâles des environs des Cuzco (coll. O. Garlepp) sont tout-à-fait identiques aux oiseaux boliviens.

### 324. METALLURA PHOEBE JELSKII (Cab.).

Tarma: un mâle adulte du 15 décembre 1891; un mâle, deux femelles et deux oiseaux jeunes de Tambo de Aza, d'octobre et de novembre 1892, de Tapo de décembre 1892, et de Queta de juillet 1893.

♂. Al. 77, caud.  $56\frac{1}{2}$ , culm.  $17\frac{1}{2}$ , caud. furca  $8\frac{3}{4}$  mm.

♀. " 66 $\frac{1}{2}$ , " 47 $\frac{1}{2}$ , " 16 $\frac{1}{2}$ , " " 4 "

Les oiseaux de Tarma appartiennent sans doute à la forme décrite par le docteur Cabanis sous le nom de *M. jelskii*. Les mâles adultes se distinguent des individus occidentaux (*M. phoebe* typique?) par le plumage généralement d'un noir mat très intense, tandis que les individus de l'occident présentent le plumage d'un noir-brun plus ou moins bronzé avec un reflet violâtre qui se manifeste surtout au-dessus de la tête. Les oiseaux de Huamachuco (Pérou du nord-ouest) recueillis par Baron ont le plumage aussi intense que les échantillons de Tarma, mais ils s'accordent avec les oiseaux de la province d'Ayacucho par le reflet bronzé du piléum. Ils sont pour ainsi dire intermédiaires entre la *M. phoebe* et la *M. ph. jelskii*.

### 325. METALLURA EUPOGON Cab.

Maraynioc: trois mâles et une femelle adulte de juillet, novembre et décembre 1891. Pariayacu: une femelle du 7 janvier 1893. "Bec et pattes noirs."

♂ ad. Al. 65, caud.  $42\frac{1}{2}$ , culm. 13, caud. furca 2 mm.

## 326. METALLURA SMARAGDINICOLLIS (Lafr. et d'Orb.).

Maraynioc : trois paires de novembre et décembre 1891.  
Pariayacu : une paire de novembre 1892 et de janvier 1893.

## 327. CHALCOSTIGMA STANLEYI (Bourc. et Muls.).

*Rhamphomicron stanleyi* Tacz. Orn. du Pérou, i. p. 345.

Maraynioc : un mâle adulte du 19 décembre 1891. "Iris noir, bec et pattes noirs."

L'oiseau de Maraynioc diffère un peu des oiseaux typiques de l'Ecuador par la pointe améthyste de la parure gulaire moins développée et un peu plus pâle, et par les parties inférieures du corps plus sombres, d'un brun enfumé légèrement lavé de violâtre au lieu d'être lavé et mêlé d'un vert olive. Par cette coloration des parties inférieures du corps notre oiseau se rapproche un peu des oiseaux boliviens (*Ch. stanleyi vulcani* Gld.) qui néanmoins présentent un mélange violâtre plus fort. Un oiseau d'Ocobamba près de Cuzco (coll. O. Garlepp) s'accorde tout-à-fait avec les oiseaux boliviens. Avant de séparer l'oiseau de Maraynioc comme sous-espèce il faudrait comparer plusieurs échantillons de cette localité.

## 328. CHALCOSTIGMA OLIVACEUM (Lawr.).

*Rhamphomicron olivaceus* Tacz. Orn. du Pérou, i. p. 347.

Tuhan : un mâle adulte du 29 octobre 1892. Maraynioc : un mâle du 29 octobre 1892.

Al. 89, caud.  $63\frac{1}{2}$ , culm.  $12\frac{1}{4}$ , caud. furca  $12\frac{1}{2}$  mm.

L'espèce a été décrite comme provenant de la Paz en Bolivie, où jusqu'à présent elle n'a pas été retrouvée.

## 329. CHALCOSTIGMA RUFICEPS AUREO-FASTIGIATUM Hart.

*Chalcostigma ruficeps aureo-fastigiatum* Hartert, Nov. Zool. vol. vi. (1899) p. 74 (descr. orig. Loja).

*Rhamphomicron ruficeps* Tacz. Orn. du Pérou, i. p. 348.

Maraynioc, Tambo de Aza : un jeune mâle du 24 octobre 1892.

Ce jeune oiseau appartient probablement à la forme décrite nouvellement par M. Hartert de l'Ecuador et du Pérou septentrional (Cutervo).

## 330. CYANOLESBIA MOCOA SMARAGDINA (Gld.).

*Cynanthus mocoa* Tacz. Orn. du Pérou, i. p. 334.

Vitoc, Garita del Sol : un mâle adulte du 1 août 1891.

Al.  $70\frac{1}{2}$ , caud. rectr. ext. 109, submed.  $63\frac{1}{2}$ , caud. furca 79, culm. 12 mm.

L'oiseau envoyé ne diffère des oiseaux boliviens recueillis par M. G. Garlepp que par le bec sensiblement plus court. Un mâle de Huasampilla, Pérou du sud (coll. Whitely), l'a aussi long que les boliviens et un mâle adulte de l'Ecuador oriental (*C. mocoa* typique) est intermédiaire sous ce rapport. La *C. mocoa smaragdina* de la Bolivie et du Pérou diffère de la *C. mocoa* typique de



l'Ecuador oriental (et de la Colombie oriental ?) par la queue un peu plus longue, par la parure gulaire bleue plus pâle et moins violâtre, enfin par le vert du dos et des côtés du pileum plus pâle et jamais noirâtre sous certain jour.

### 331. POLYONYMUS CAROLI (Bourc.).

*Sappho caroli* Tacz. Orn. du Pérou, i. p. 337.

Tapo : une femelle adulte du 27 décembre 1892.

Al. 57, rectr. ext.  $45\frac{1}{2}$ , submed.  $40\frac{1}{2}$ , culm.  $18\frac{3}{4}$  mm.

Cette femelle ressemble à l'oiseau décrit par Taczanowski comme jeune mâle et diffère du mâle adulte par la gorge blanche ornée sur chaque plume d'une plaque rouge de feu doré, tandis que chez le mâle adulte la gorge est d'un rouge grenat uniforme et non interrompu par des bordures blanches latérales et par les bases blanches comme c'est les cas chez la femelle. La barbe externe de la rectrice la plus externe et la pointe de la barbe interne sont d'un blanc roussâtre.

### 332. PSALIDOPRYMNA JULIE Hartert.

*Psalidoprymna juliae* Hartert, Nov. Zool. vi. (1899) p. 75 ("Northern Peru").

Tapo : trois mâles adultes des 24 et 27 décembre 1892.

Al. 63–61 $\frac{1}{2}$ , caud. 127–111 $\frac{3}{4}$ , culm.  $13\frac{3}{4}$ – $13\frac{1}{2}$ , caud. furca 101–85 $\frac{1}{4}$  mm.

Cette espèce tout-à-fait distincte nommée par nous provisoirement *Lesbia juliae* (P. Z. S. 1896, p. 323) a été décrite sous ce nom par M. Hartert d'après des exemplaires recueillis par M. O. T. Baron dans le nord du Pérou.

Les échantillons de Tapo ne diffèrent des oiseaux de Cajabamba (coll. Baron) que par le bec et la queue un peu plus longs.

Il est à remarquer que nous avons eu l'intention de dédier cette espèce à la comtesse Julie Branicka, épouse du comte Ladislav Branicki.

### 333. CALLIPHLOX AMETHYSTINA (Gml.).

La Merced : un mâle adulte du 19 juillet 1890.

Al. 36 $\frac{1}{4}$ , caud. 34 $\frac{1}{4}$ , culm. 15, caud. furca 17 $\frac{1}{2}$  mm.

Ce mâle unique diffère des mâles du Brésil méridional par le bec et les ailes plus longs et le rouge de la parure gulaire plus clair et moins violâtre. Comme il y a une variation individuelle considérable chez la *C. amethystina*, il faudrait une série d'exemplaires pour s'assurer de la constance des points différentiels.

### 334. HELIOTHRIX AURICULATUS (Nordm.).

? *Heliothrix auritus* Tacz. Orn. du Pérou, i. p. 363.

La Merced : un mâle adulte et un jeune mâle de janvier et septembre 1891. "Bec et pattes noirs."

♂ ad. Al. 64, caud. 43 $\frac{1}{2}$ , culm. 16 $\frac{1}{2}$  mm.

Le mâle adulte (en mue) ne diffère des oiseaux du Brésil méridional que par le vert du menton un peu plus étendu en bas,



mais pas aussi étendu qu'il ne paraît en être le cas chez le *H. phainolema* Gould du "Rio Napo."

Le jeune mâle possède encore la queue longue comme la femelle, mais il présente la gorge et le haut de la poitrine d'un blanc pur sans taches brunes-verdâtres. Les plumes ornementales bleues-violettes de la région auriculaire commencent déjà à se développer.

Espèce nouvelle pour la faune péruvienne.

335. *ACESTRURA MULSANTI* (Bourc.).

Garita del Sol: deux mâles adultes de juin et juillet 1891.

Il n'y a pas de différence entre ces oiseaux et les individus de la Colombie. Peut-être les échantillons du Pérou et de la Bolivie ont-ils les ailes généralement un peu plus courtes.

+ 336. *KLAIS GUIMETI MERRITTI* (Lawr.).

*Klais guimeti* Tacz. Orn. du Pérou, i. p. 364.

Borgoña: cinq mâles d'avril 1891.

Al. 51, caud.  $29\frac{1}{2}$ , culm.  $11\frac{1}{4}$  mm.

La forme du Pérou s'accorde le mieux avec celle de l'Amérique centrale (cf. Tacz. l. c.).

+ 337. *LOPHORNIS REGULUS* (Gould).

*Lophornis delattrei* Tacz. (nec Less.) Orn. du Pérou, i. p. 299.

La Borgoña: un jeune mâle et un jeune oiseau sans indication du sexe du 9 juin 1891. "Iris noir, bec noir à mandibule inférieure d'un carné-brunâtre à la base; pattes noires."

Ces oiseaux appartiennent probablement à la forme *L. lophotes* Gld., décrite comme provenant du Pérou, mais on ne peut juger d'après des oiseaux non adultes.

Fam. CYPSELIDÆ.

+ 338. *CHÆTURA ZONARIS* (Shaw).

La Merced: cinq femelles de juillet et août 1890. "Iris brun foncé."

♀. Al. 204, caud.  $77\frac{1}{2}$ , culm. 9, tars.  $20\frac{1}{2}$  mm.

339. *CHÆTURA SCLATERI* Pelz.

La Gloria: une femelle du 13 août 1890. "Iris brun foncé."

+ 340. *CYPSELOIDES BRUNNEITORQUES* (Lafr.).

*Chætura rutila* Tacz. Orn. du Pérou, i. p. 229.

La Gloria: trois individus d'août 1890. "Iris noir."

La Merced: une femelle du 2 janvier 1891.

♂. Al. 128, caud. 50, culm.  $5\frac{1}{2}$ , tars.  $10\frac{3}{4}$  mm.

♀ ♀. Al.  $128\frac{1}{2}$ –122, caud.  $50$ – $45\frac{1}{2}$ , culm.  $6\frac{1}{2}$ – $5\frac{1}{2}$ , tars.  $12\frac{1}{2}$ – $10\frac{1}{2}$  mm.

Mr. Hartert (Cat. B. Brit. Mus. xvi. p. 494) dit: "Female without the rufous collar"; mais nos trois femelles présentent le

collier roux aussi large que le mâle. Une femelle recueillie le 7 août s'accorde en tout avec le mâle, tandis que les autres femelles diffèrent par le roux de la gorge et de la poitrine à peine indiqué par quelques bordures d'un roux brun, et par les ailes et la queue plus courtes.

Le mâle de La Gloria ne diffère des mâles de Mapoto, Ecuador oriental, que par le roux plus intense et par le noir de l'abdomen plus pur. Le type venait de Bogotá.

Fam. CAPRIMULGIDÆ.

341. CAPRIMULGUS OCELLATUS Tsch.

*Antrostomus ocellatus* Tacz. Orn. du Pérou, i. p. 215.

Garita del Sol: un mâle adulte du 20 juillet 1891. "Iris noir, bec noir, pattes d'un brun-carné."

342. STENOPSIS LONGIROSTRIS (Bp.).

*Stenopsis bifasciata* Tacz. Orn. du Pérou, i. p. 221.

Maraynioc, Pariayacu: un mâle non complètement adulte du 10 juillet 1892. "Iris noir."

Al.  $158\frac{1}{2}$ , caud.  $118\frac{1}{2}$ , culm.  $15\frac{1}{2}$ , tars.  $16\frac{1}{2}$  mm.

S'accorde avec un oiseau de Chicani, Bolivie, recueilli par M. Garlepp.

La *H. ruficervix* Scl. de la Colombie n'est probablement qu'une sous-espèce de la *H. longirostris*. Elle n'en diffère que par les dimensions un peu plus petites (surtout la queue plus courte), les parties supérieures plus variées de roussâtre, les points roussâtres du piléum plus distincts et plus intenses, les bandes blanches des rémiges plus larges, et par d'autres petits détails de la coloration. Les oiseaux du Pérou méridional classifiés par M. Hartert sous la *H. ruficervix* appartiennent certainement à la *H. longirostris*.

+ 343. NYCTIDROMUS ALBICOLLIS (Gml.)

La Merced: deux mâles de juillet et d'août 1890. "Iris brun foncé."

344. HYDROPSALIS TORQUATA (Gml.).

La Merced: un mâle adulte du 28 juin 1891. Chontabamba: un jeune mâle du 13 septembre 1891. "Iris et bec noirs, pattes d'un brun grisâtre."

Al.  $166\frac{1}{2}$ , rectr. ext.  $257\frac{1}{2}$ , subext. 153, culm.  $12\frac{1}{4}$ , tars.  $18\frac{1}{2}$  mm.

Espèce nouvelle pour la faune péruvienne. Le mâle envoyé ne diffère d'un mâle adulte de Bahia, Brésil, du Musée Berlepsch, que par les ailes un peu plus courtes, la queue beaucoup plus courte, l'abdomen plus blanchâtre et la bande rousse nucale moins vive.

Peut-être ces différences ne sont-elles qu'individuelles. En tout cas notre oiseau n'appartient pas à la *H. furcifera* (Vieill.) qui présente des couleurs plus pâles et des dimensions généralement plus grandes.

345. *HYDROPSALIS CLIMACOCERCUS* Tsch.

*Hydropsalis trifurcata*, Tacz. Orn. du Pérou, i. p. 224.

La Merced : quatre individus de juillet et août 1890, et un jeune mâle de 7 janvier 1891. "Iris noir, pattes d'un brun cendré."

346. *MACROPSALIS KALINOWSKII* Berl. et Stolz.

*Macropsalis kalinowskii* Berl. et Stolz. Ibis, 1894, p. 399, descr. orig. (Pariayacu).

*Hydropsalis segmentata* Tacz. (nec Cass.) Orn. du Pérou, i. p. 223.

Pariayacu près de Maraynioc : cinq mâles adultes et trois femelles des 26 octobre, 5 et 6 novembre, 12 décembre 1891, du 16 septembre 1892 et du 26 février 1893. "Iris noir, bec noir, pattes d'un brun-carné."

Malheureusement quand nous décrivîmes cette forme sous la dénomination de *M. kalinowskii* il nous manquait des échantillons de la *M. segmentata* Cass. de Bogotá pour la comparaison. Depuis lors Berlepsch a reçu deux mâles de cette dernière espèce provenant des collections indiennes des environs de Bogotá qui prouvent que la différence entre la *M. kalinowskii* et la *M. segmentata* n'est pas aussi prononcée que nous l'avions supposé.

En effet les deux formes ne diffèrent presque que dans le dessin des rectrices externes chez les mâles adultes. Chez la *M. kalinowskii* les barbes internes de ces rectrices sont pourvues de bandes irrégulières blanchâtres dans toute leur longueur, occupant la moitié de la barbe vers la tige. Ces bandes manquent presque complètement chez la *M. segmentata* ou ne se manifestent que dans le tiers apical de ces rectrices chez quelques individus (les plus jeunes?). Il paraît aussi que chez la *M. kalinowskii* les barbes externes de ces rectrices sont d'un blanc plus pur et jamais tachetées de roussâtre, ce qui se trouve quelquefois chez l'autre espèce. En outre chez la première ces rectrices sont plus atténuées, à barbe interne plus étroite dans le tiers apical. L'abdomen paraît plus noirâtre, moins roussâtre que chez la *M. segmentata*. La bande subterminale blanchâtre des rectrices les plus courtes (sauf les médianes) qui se manifeste chez la *M. kalinowskii*, est à peine indiquée au milieu de la barbe interne des deux paires sub-externes chez la *M. segmentata*. Enfin la première est un peu plus petite, à queue un peu plus courte.

Les autres points de différence indiqués par nous ne paraissent pas être constants.

347. *LUROCALIS RUFIVENTRIS* Tacz.

La Gloria : deux femelles des juillet et d'août 1890. "Iris noir."

Les femelles s'accordent dans tous les détails avec les oiseaux typiques.

## Fam. PICIDÆ.

## 348. COLAPTES PUNA Cab.

Ingapirca: cinq individus d'avril et juin 1890. Maraynioc: un mâle ad. et une femelle jeune de février 1893. "Iris jaune olivâtre."

Les types du Muséum de Berlin venaient de la vallée de Tauli, Pérou occidental.

## 349. HYPOXANTHUS RIVOLII BREVIROSTRIS (Tacz.).

Maraynioc: une femelle du 18 novembre 1891. Un mâle et deux femelles de juillet et août 1892 et de mai 1893.

## † 350. CHLORONERPES CHRYSOGASTER, sp. nov.

*Chl. Chl. canipileus et Chl. gularis dictis affinis, differt abdomine sulphureo-aureo-flavo fere immaculato (nec viridescenti-flavo, olivaceo-viridi fasciato), dorso alisque extus magis aurantio-brunneis minus olivaceis, pectore aurantio-brunneo tincto nec olivaceo-viridi, uropygio fere sicut in Chl. gularis dicto flavescente crebre fasciato, sed magis rubro tincto.*

♂ ♂. Al. 128, caud.  $83\frac{1}{2}$ –78, culm.  $26\frac{3}{4}$ – $24\frac{3}{4}$ , tars.  $22\frac{1}{2}$  mm.  
♀. „ 129, „  $83\frac{1}{2}$ , „  $27\frac{3}{4}$ , „ 21 „

*Hab.* in Peruvia centrali: La Gloria et Garita del Sol.

*Typus* in Mus. Branicki: ♂ ad. La Garita del Sol, 29 vi. 1891. T. Kalinowski, legit no. 1282.

La Gloria: une femelle adulte du 7 août 1890. "Iris brun rougeâtre." Garita del Sol: deux mâles adultes de juin et juillet 1891, et deux autres des mars et d'avril 1893.

Les oiseaux recueillis par M. Kalinowski se distinguent au premier coup d'œil des oiseaux de la Bolivie (*Chl. canipileus* typique), dont Berlepsch possède une bonne série, par l'abdomen d'un jaune de soufre doré presque sans macules, tandis que chez le *Chl. canipileus* il est plus verdâtre et rayé régulièrement de bandes d'un vert-olive obscure. Il en est de même pour les tectrices souscaudales. Chez la nouvelle espèce le dos et les ailes en dessus sont d'un brun-olive orangé très-vif au lieu d'un olive-verdâtre; la poitrine fortement lavée d'un brun-orangé au lieu de verdâtre, enfin le croupion plus jaunâtre à bandes transversales plus distinctes et lavé fortement de rouge de sang.

C'est un fait curieux que les oiseaux boliviens (*Chl. canipileus*) ressemblent plutôt aux oiseaux de la Colombie et du Vénézuëla (*Chl. rubiginosus*) qu'aux péruviens.

## 351. CHLORONERPES LEUCOLÆMUS (Malh.).

Chanchamayo: une femelle d'août 1890. La Gloria: une femelle du 20 janvier 1891. "Iris brun foncé."

## 352. MELANERPES CRUENTATUS (Bodd.).

La Gloria: une paire d'août 1890. "Iris rouge-orangé."



## 353. DENDROBATES FUMIGATUS (Laf. et D'Orb.).

Garita del Sol : une femelle du 4 août 1891. Vitoc : un mâle du 7 février 1893.

## +354. DENDROBATES MALHERBEI PECTORALIS, subsp. nov.

*D. D. malherbei dicto (ex Ecuadoria) affinis, differt corpore supra subtusque obscuriore olivaceo, fasciis in pectore (semper ut videtur) magis arcuatis, interdum cordiformibus vel maculiformibus, rostro pro usu longiore, alis vero brevioribus. Fœminæ pileo sicut in D. malherbei dicto brunneo-olivaceo.*

*Mas quoad colores D. nigriceps dicto ex Bolivia maxime affinis ut videtur, sed rostro brevior.*

♀ ♀ ad. Al.  $96\frac{1}{2}$ – $92\frac{1}{2}$ , caud. 71–64, culm.  $24\frac{1}{2}$ – $22\frac{1}{2}$ , tars.  $22\frac{3}{4}$ – $19\frac{1}{2}$  mm.

*Hab.* in Peruvia centrali; Maraynioc, altitudo 13,000 pedum.

*Typus* in Mus. Branicki et Mus. Berlepschi.

Maraynioc, Pariayacu : deux femelles adultes des 6 et 8 août, un jeune mâle du 30 août 1892, et une jeune femelle du 26 octobre 1891. “Iris rouge foncé, bec brun-corné, à mandibule inférieure blanchâtre, pattes d'un gris plombé.”

Cette forme nouvelle, dont M. Kalinowski n'a malheureusement envoyé que des femelles et un mâle très-jeune, paraît intermédiaire entre le *D. malherbei* Scl.<sup>1</sup> de l'Ecuador et le *D. nigriceps* d'Orb. de la Bolivie. La femelle a le sommet de la tête d'un olive foncé noirâtre comme les femelles de l'Ecuador et non noir intense comme les femelles de la Bolivie. La couleur du dessus et du dessous du corps est beaucoup plus claire que chez les oiseaux de l'Ecuador mais ressemble à celle des oiseaux boliviens. Néanmoins il y a une différence considérable dans le dessin de la poitrine : tandis que chez tous les individus de l'Ecuador et de la Bolivie examinés par nous les bandes blanchâtres de la poitrine sont tout-à-fait régulières et d'une largeur uniforme dans toute leur étendue, chez les oiseaux de Maraynioc elles sont échancrées au milieu vers la base de la plume et deviennent plus étroites vers les côtés. Une femelle adulte du 28 octobre a même les bandes réduites à des taches cordiformes, ce qui donne à la poitrine une apparence tout-à-fait différente de celle de l'abdomen, qui est rayé régulièrement de bandes d'un blanc jaunâtre et paraît plus clair.

La longueur du bec paraît intermédiaire entre celle du *D. malherbei* et celle du *D. nigriceps*. Les ailes sont plus courtes que chez les autres formes.

## 355. DENDROBATES VALDIZANI Berl. et Stolz.

*Dendrobates valdizani* Berl. et Stolz. Ibis, 1894, p. 401 (descr. orig.).

<sup>1</sup> L'espèce équadorienne confondue par MM. Sclater et Hargitt avec le *D. nigriceps* d'Orb. de la Bolivie en est tout-à-fait distincte ; elle est plus petite, surtout à bec plus court, et présente une coloration plus claire en dessus et en dessous. Le mâle a le rouge du piléum plus clair et la femelle y présente une couleur brun-olive un peu noirâtre au lieu d'un noir intense.



Iluacras, Vitoc : un mâle unique du 14 décembre 1892. " Iris brun foncé."

356. DENDROBATES HÆMATOSTIGMA (Malh.).

*Chloronherpes hilaris* Cab. et Heine, Tacz. Orn. du Pérou, iii. p. 81.

La Gloria, août 1890. } Trois individus.

La Merced, septembre 1890. } " Iris brun foncé."

Garita del Sol : deux mâles adultes, un jeune mâle et une femelle.

Les oiseaux péruviens ont les ailes et la queue un peu plus longues et la nuance des raies foncées des parties inférieures plus brunâtres et moins olivâtres que les oiseaux de la Bolivie. Il paraît que M. Malherbe a fondé son *M. hæmatostigma* sur les oiseaux recueillis par Natterer à Borba et Marabitanas. Peut-être qu'on pourrait séparer les oiseaux péruviens sous la dénomination de *D. hæmatostigma hilaris* (Cab. et Hein.).

357. CAMPEPHILUS MELANOLEUCUS (Gm.).

Borgaña : une femelle du 23 avril 1891. " Iris jaune olivâtre, bec blanc brunâtre, pattes d'un gris olivâtre."

Les oiseaux du Pérou central (en outre un mâle adulte recueilli à Callanga près de Cuzco par M. O. Garlepp) présentent des dimensions plus petites que les individus de Cayenne et de Bogotà du Musée Berlepsch. Ils ont aussi le blanc des tectrices sousalaires et des barbes internes des rémiges plus lavé de jaunâtre.

358. CAMPEPHILUS POLLENS (Bp.).

Maraynioc, Calamachay : un mâle et deux femelles adultes du 24 juillet 1892.

♂. Al. 176½, caud. 127, culm. 50, tars. 35½ mm.

♀. „ 176, „ 127, „ 49½, „ 35½ „

Ces individus ne diffèrent des échantillons de Bogotà du Musée Berlepsch que par les ailes et la queue plus courtes. C'est probablement un caractère individuel.

Espèce nouvelle pour la faune péruvienne.

+359. CEOPHLEUS LINEATUS (L.).

La Merced : un oiseau du 25 août 1890. " Iris blanche."

La Gloria : un mâle du 18 janvier 1891. " Iris blanc, bec brun pâle, pattes d'un plombé clair."

360. PICUMNUS JELSKII Tacz.

Garita del Sol : deux mâles adultes, une femelle adulte et un jeune de juillet et septembre 1891. " Iris brun foncé, bec brun corné à mandibule supérieure sur les côtés—et la mandibule inférieure en entier—d'un plombé bleuâtre ; pattes d'un plombé bleuâtre."

361. *PICUMNUS PUNCTIFRONS* Tacz.

La Merced : une paire de juillet et septembre 1890. "Iris brun foncé." Deux mâles et une femelle de mars et avril 1891.

Fam. *ALCEDINIDÆ*.

† 362. *CERYLE AMAZONA* (Lath.).

La Merced : deux mâles de janvier et mars 1891. "Iris, bec et pattes noirs."

| 363. *CERYLE AMERICANA* (Gm.).

*Ceryle americana* et *C. cabanisi* part., Tacz. Orn. du Pérou, iii. pp. 104, 105.

La Merced : trois individus de juillet et septembre 1890, "iris brun foncé," et deux mâles adultes de décembre 1890 et mars 1891.

Fam. *MOMOTIDÆ*.

† 364. *PRIONIRHYNCHUS PLATYRHYNCHUS* (Leadb.), subsp. nov. ?

Specimina e Peruvia centrali: *rectricibus mediis omnino vexillis præditis nec spatulatis, mento rufo-brunneo gulæ concolore, nec cærulescente.*

♂. Al. 120, caud. 201½, culm. 38, tars. 18 mm.

La Merced : une paire du 1 septembre 1890. "Iris presque noir."

Borgoña : deux mâles adultes de mai 1891.

L'oiseau typique de Leadbeater est dit être venu du Brésil, d'où l'espèce n'est pas mentionnée par les auteurs contemporains. Dans la planche de Jardine et Selby, faite d'après l'oiseau typique, il est représenté à rectrices médianes spatulées, tandis que les oiseaux recueillis par Kalinowski, de même que deux échantillons de la Bolivie envoyés par M. Garlepp, ont les rectrices médianes barbées dans toute leur longueur et ne présentant pas de spatules. D'autre part deux oiseaux de Costarica et de Veragua du Musée Berlepsch ont les rectrices médianes spatulées. Peut-être est-ce un cas analogue à celui du *Momotus martii* et du *M. semirufus* (voir Berl. Journ. f. Orn. 1889, p. 308).

Les oiseaux du Pérou central diffèrent de ceux de la Bolivie ayant le menton roux-brun concolore à la gorge au lieu d'un bleu verdâtre. En cas qu'il faille séparer les oiseaux péruviens du vrai *P. platyrhynchus* nous proposons de les nommer *P. p. pyrrholæmus* Berl. et Stolz.

† 365. *MOMOTUS ÆQUATORIALIS CHLOROLÆMUS*, subsp. nov.

*M. M. æquatorialis dicto simillimus, sed corpore supra subtusque pallide cærulescenti-viridi (nec saturate rufescenti-olivaceo-viridi), collo posteriore vix rufescente lavato, colore cincturæ pilei pallidius cæruleo, gula magis cærulescente lavata, necnon plumis latis pectoralibus nigris magis cærulescente marginatis distinguendus.*

*Hab.* in Peruvia centrali or. (Ocobamba prope Cuzco, La Gloria, Garita del Sol).

*Typus* in Mus. Berlepsch (♂. Ocobamba, O. Garlepp legit no. 131).

La Gloria (janvier 1891). Garita del Sol (juillet et août 1891): une paire d'oiseaux adultes et un jeune mâle; deux femelles de Garita del Sol et de Pariayacu de juillet 1892 et de février 1893. "Iris rouge, bec noir, pattes brunes."

† 366. *MOMOTUS MOMOTA IGNOBILIS* (Berl.).

*Momotus brasiliensis* Lath.; Tacz. Orn. du Pérou, iii. p. 108.

? *Momotus bartletti* Sharpe, Cat. Birds Brit. Mus. xvii. p. 320.

La Merced: trois individus de juillet 1890. "Iris rouge."

♂. Al. 135½, caud. 247, culm. 39½, tars. 26 mm.

S'accordent avec les oiseaux de Yurimaguas que Berlepsch a nommés *brasiliensis ignobilis*, seulement à bec un peu plus court.

367. *UROSPATHA MARTII* (Spix).

La Merced: une femelle du 1 septembre 1890.

Fam. TROGONIDÆ.

368. *PHAROMACRUS ANTISIANUS* (D'Orb.).

Garita del Sol: un mâle du 8 avril 1893.

Al. 191½, caud. 164½, culm. 19¾, tars. 15½ mm. "Iris rouge-cerise, bec jaune sale, pattes d'un gris olivâtre."

S'accordent avec les individus de la Bolivie recueillis par M. G. Garlepp.

369. *PHAROMACRUS AURICEPS* (Gould).

Garita del Sol: un mâle adulte du 4 septembre 1891 et une femelle du 22 septembre 1892.

370. *TROGON PERSONATUS* Gould.

Garita del Sol: une paire du 20 novembre 1891. Maraynioc: deux mâles et une femelle d'octobre et novembre 1892 et de février 1893.

371. *TROGON COLLARIS* Vieill.

La Gloria: un mâle adulte d'août 1890 et trois mâles adultes de janvier et février 1891. La Merced: un mâle adulte de septembre 1890 et un mâle adulte de mars 1891. "Iris brun foncé, bec jaune."

Les échantillons recueillis par M. Kalinowski s'accordent le mieux avec un individu de l'Écuador oriental (Musée Berlepsch) et ne diffèrent que par les lignes noires et blanches des tectrices sousalaires plus larges, la tête et le cou d'un vert plus jaunâtre ou doré au lieu de bleuâtre, les ailes un peu plus courtes, la queue plus longue. Il paraît que les oiseaux de l'occident ont le rouge

de l'abdomen écarlate au lieu de rosé comme chez les oiseaux de Cayenne.

372. *TROGON MERIDIONALIS RAMONIANUS* (Dev. et Des Murs).

La Merced : une femelle du 31 mars 1891. "Iris brun foncé, bec brun en dessus, la mandibule inférieure et les côtés de la mandibule supérieure à la base d'un gris plombé ; pattes brunes."

Fam. GALBULIDÆ.

373. *GALBULA TOMBACEA CYANESCENS* (Deville).

*Galbula tombacea* Tacz. Orn. du Pérou, iii. p. 115.

La Gloria et La Merced : sept individus de juillet à septembre 1890. La Merced : une femelle et un oiseau sans indication de sexe, janvier et mars 1891. "Iris brun foncé."

	Long. tot.	Enverg.	Aile.	Queue.	Culm.	Tars.
♂ ♂.	248, 249	242, 283	83, 82	99, 96½	55, 53	11½ mm
♀.	244	286	80	94	51½	12½ „

Ces oiseaux appartiennent à la forme à front d'un vert métallique et non brunâtre. Il nous paraît que la description de M. Deville dans la Rev. et Mag. de Zool. 1849, p. 56, a rapport à cette forme et non à celle à front brunâtre, car on y lit "la tête d'un vert bleu." Mais Deville a recueilli des individus des deux formes, comme l'a constaté M. Selater (Jac. & Puffb. p. 25). D'autre part M. Spix a décrit sa *Galbula tombacea* comme ayant le front brun ("fronte brunnescente").

Fam. BUCCONIDÆ.

374. *BUCCO STRIOLATUS* Pelz.

La Merced : un mâle adulte du 4 septembre 1890. "Iris d'un ochreux pâle."

Al. 82, caud. 68½, culm. 26½, tars. 18 mm.

+375. *MALACOPTILA FULVIGULARIS MELANOPOGON*, subsp. nov.

*Malacoptila fulvogularis* Tacz. Orn. du Pérou, iii. p. 132.

*M. M. fulvicularis dictæ simillima, differt linea frontali fasciculisque rictalibus pure albis nec fulvescenti-albis, plumis mentalibus retrorsum curvatis nigrescentibus nec fulvis, colore gulæ intensius rufescente, striis pectoralibus albis magis fulvescente tinctis, necnon tectricibus alarum superioribus magis conspicue fulvo striatis et apicatis.*

♂.	Al. 94½,	caud. 89,	culm. 25½,	tars. 17½ mm.
♀.	„ 95½,	„ 95,	„ 27½,	„ 20½ „

*Hab.* in Peruvia centrali : Garita del Sol et Maraynioc.

*Typus* in Mus. H. v. Berlepsch : ♂ La Garita (T. Kalinowski, legit no. 1330).

Garita del Sol : deux mâles et une femelle de juillet 1891.

"Iris rouge, bec noir, pattes d'un gris olivâtre." Maraynioc Tendalpata : une femelle du 27 avril 1893.

Comparés aux les oiseaux typiques de la Bolivie, les péruviens diffèrent par la ligne frontale et les fascicules aux côtés de la gorge d'un blanc pur au lieu d'un blanc roussâtre, par les poils recourbés du menton noirâtres au lieu d'un roussâtre clair, par les stries pectorales blanches plus distinctement lavées de roussâtre, enfin par les tectrices sousalaires plus variées et striées de roussâtre.

### 376. MONASA PERUANA ScL.

La Merced : une paire d'août et de septembre 1890. "Iris brun, bec rouge miniacé."

La Gloria : une femelle du 6 février 1891.

### 377. CHELIDOPTERA TENEBROSA (Pall.).

La Merced : trois mâles de juillet et de septembre 1890, et un mâle du 3 avril 1891. "Iris noir."

S'accordent avec les oiseaux de la Guyane britannique.

## Fam. CUCULIDÆ.

### + 378. PIAYA CAYANA NIGRICRIS (ScL.).

La Gloria : une paire de juillet et d'août 1890. "Iris rouge-cerise, bec jaune verdâtre."

### + 379. PIAYA RUTILA (Ill.).

La Merced : une femelle du 14 janvier 1891. "Iris rouge, tout de l'œil rouge foncé, bec jaune olivâtre, pattes brunes."

Al.  $115\frac{1}{2}$ , caud. 173, culm.  $21\frac{1}{2}$ , tars.  $28\frac{1}{2}$  mm.

L'oiseau envoyé a les ailes et la queue plus longues que chez tous les oiseaux de Surinam, Trinidad, Orénoque, Bogotá et de l'Ecuador examinés par nous. Néanmoins une femelle de l'Orénoque n'est pas trop différente sous ce rapport.

### + 380. CROTOPHAGA ANI L.

La Merced : deux mâles du 20 août 1890, "iris brun foncé" ; et deux mâles de mars et avril 1891.

## Fam. CAPITONIDÆ.

### 381. CAPITO GLAUCOGULARIS Tsch.

Garita del Sol : trois mâles et cinq femelles de juin, juillet, août et octobre 1891, et de mars et avril 1893. "Iris rouge, bec et pattes d'un vert olivâtre."

## Fam. RHAMPHASTIDÆ.

### + 382. RHAMPHASTOS AMBIGUUS Sw.

Trois mâles de Borgoña de janvier 1891, et de La Gloria de février 1891.



383. *ANDIGENA HYPOGLAUCUS* (Gould).

Maraynioc : deux mâles adultes du 15 novembre 1891, un mâle et deux femelles de Pariayacu et de Culumachay d'août et octobre 1892.

384. *SELENIDERA LANGSDORFFI* (Wagl.).

Borgoña : une paire d'avril et mai 1891.

♂. "Iris vert olivâtre, bec noir, les côtés de la mandibule supérieure à la base et la plus grande partie de la mandibule inférieure d'un olive jaunâtre sale; les parties nues autour de l'œil d'un vert bleuâtre; pattes d'un bleu verdâtre sale.

♀. "Iris vert olivâtre, bec noir, les côtés de la mandibule supérieure à la base et la plus grande partie de la mandibule inférieure d'un vert bleuâtre sale teintées de jaune; parties nues autour de l'œil d'un vert bleuâtre tirant sur le jaunâtre; pattes d'un vert bleuâtre."

385. *AULACORHAMPHUS DERBIANUS* (Gould).

La Gloria (janvier 1891).  
Garita del Sol (août 1891). } Deux paires.

"Iris rouge brunâtre; bec noir, rouge à la base et à l'extrémité; à la base même il y a une ligne blanche; pattes d'un plombé grisâtre teinté de verdâtre."

386. *AULACORHAMPHUS CÆRULEO-CINCTUS* (Tsch.).

Garita del Sol : trois mâles et une femelle de juillet et septembre 1891, et de Garita del Sol du 17 avril 1893. "Iris jaune blanchâtre, bec plombé corné plus clair à la base; pattes d'un plombé olivâtre."

387. *AULACORHAMPHUS ATROULARIS* (Sturm).

La Merced. }  
La Gloria. } Deux femelles de janvier et février 1891.

"Iris d'un rouge-brique brunâtre; bec noir blanc à la base, d'un jaune olivâtre sur l'arête dorsale; pattes d'un plombé olivâtre."

## Fam. PSITTACIDÆ.

388. *LEPTOSITTACA BRANICKII* Berl. et Stolz.

*Leptosittaca branickii* Berl. et Stolz. Ibis, 1894, p. 402, pl. xi. (descr. orig.).

Maraynioc, Culumachay, Pariayacu et Huarmipacha : deux mâles adultes, quatre femelles adultes, et un jeune (23 juillet), recueillis les 6 et 23 juillet 1892, 2 mars, 27 avril, 15 juin et 15 novembre 1893. "Iris rouge ou rouge ocracé et rouge sale, bec d'un gris corné sale, pattes brunâtres."

389. *CONURUS MITRATUS* Tsch.

La Merced : une paire du 1 septembre 1890. Garita del Sol :

une paire du 24 avril 1893. "Iris jaune, bec blanc jaunâtre, pattes carnées."

390. *CONURUS LEUCOPHTHALMUS* (Müll.).

*Conurus guianensis* Tacz. Orn. du Pérou, iii. p. 199.

La Merced: une femelle du 12 avril 1891. "Iris, l'anneau extérieur orangé rosâtre, l'intérieur mince d'un gris bleuâtre; bec blanc jaunâtre sale; parties nues autour de l'œil d'un cendré brunâtre; pattes d'un gris brunâtre."

391. *PYRRHURA RUPICOLA* (Tsch.).

*Conurus rupicola* Tacz. Orn. du Pérou, iii. p. 201.

La Gloria: trois individus d'août 1890, un mâle et trois femelles de janvier et février 1891.

La Merced: janvier 1891.

Garita del Sol: juin 1891.

"Iris brun foncé."

392. *BOLBORHYNCHUS ANDICOLA* (Finsch).

Maraynioc: trois femelles de décembre 1891. Pariayacu: un mâle du 22 juillet 1892. "Iris brun foncé, bec jaune olivâtre sale, pattes d'un jaune sale."

393. *CHRYSOTIS MERCENARIA* (Tsch.).

La Gloria. }  
La Merced. } Trois individus d'août 1890. "Iris rouge."

La Gloria (janvier). }  
Garita del Sol (juillet). } Deux paires.

394. *PIONUS MENSTRUUS* (L.).

La Merced: un mâle du 29 juillet 1890. "Iris brun."

395. *PIONUS TUMULTUOSUS* (Tsch.).

Vitoc (Tendalpata): deux mâle adultes du 27 avril 1893. "Iris brun foncé, bec jaune, la cire grise, les parties nues autour de l'œil noires enfumées, pattes d'un gris sale."

Fam. STRIGIDÆ.

396. *BUBO VIRGINIANUS MAGELLANICUS* (Gm.).

Ingapirca: un mâle du 9 juin 1890. Tarma: un mâle du 16 juillet 1893. "Iris jaune orangé, bec et ongles noirs."

397. *MEGASCOPS CHOLIBA* (Vieill.)<sup>1</sup>.

Garita del Sol: un mâle adulte du 6 juillet 1891. "Iris brun foncé, bec plombé bleuâtre, pattes d'un carné pâle."

Al. 202½, caud. 106, culm. 16½, tars. 34 mm.

Cet oiseau à dimensions assez grandes présente la phase brune

<sup>1</sup> Berlepsch a trouvé que le nom "*brasiliannus*" de Gmelin, basé surtout sur le "Caburé" de Marcgrave, s'applique réellement au *Glaucidium ferox*, et non à l'espèce de *Megascops* qui jusqu'à présent a porté ce nom.

noirâtre. Le *Megascops* qui habite le Pérou oriental et l'Amazonie supérieur (Yquitos) paraît identique à l'oiseau du Paraguay (*M. choliba* typique).

+ 398. *PULSATRIX MELANONOTA* (Tsch.).

La Gloria (janvier). } Deux femelles adultes et  
La Merced et Borgoña (avril 1891). } une jeune femelle.  
"Iris noir, bec jaune olivâtre, pattes d'un jaune sale."

Ces oiseaux s'accordent tout-à-fait avec la description et la figure données par Tschudi. La description dans l'Ornithologie du Pérou par Taczanowski (i. p. 184), faite d'après un oiseau du Brésil, ne se rapporte pas à l'espèce de Tschudi, mais à une forme bien distincte.

+ 399. *GLAUCIDIUM JARDINEI* Bp.

Maraynioc, Pariayacu, et Culumachay : deux jeunes mâles du 8 juillet 1892.

Al.  $98\frac{1}{2}$ —97, caud.  $65\frac{1}{2}$ , culm.  $11\frac{3}{4}$ — $11\frac{1}{4}$ , tars.  $19\frac{1}{2}$  mm.

Ces oiseaux diffèrent des oiseaux de jeune âge de l'Ecuador en ce qu'ils présentent de taches ou macules roussâtres sur la tête plus larges, par les tectrices auriculaires rayées de bandes noirâtres, par les taches roussâtres du dos plus grandes et par les côtés de la poitrine plus distinctement traversés de bandes roussâtres.

Il faudrait voir des oiseaux adultes de cette localité pour se convaincre si les points de différence sont constants ou individuels.

+ 400. *SPEOTYTO CUNICULARIA* (Mol.).

*Pholeoptynx cunicularia* Tacz. Orn. du Pérou, i. p. 144, pt.

Junin (Ingapirca) : un mâle tué le 6 mai 1890. "Iris jaune."

Il paraît qu'il existe dans les environs de Junin une race locale de la *S. cunicularia* plus grande que toutes les autres formes de *Speotyto* connues. En cas que la différence dans la taille entre cette forme et la *S. cunicularia* typique du Chili serait constante nous lui réservons la dénomination de *S. cunicularia juninensis* Berl. & Stolzm.

♂♂. Al. 200—193, caud. 100—93, culm. 22—21, tars. 43—41 mm.

♀. „ 213, „ 110, „ 23, „ 50 „

En tout cas les oiseaux de Lima sont toujours beaucoup plus petits, à couleure généralement plus claire, moins roussâtre, et à tarse moins emplumé que les individus de Junin.

+ 401. *STRIX FLAMMEA PERLATA* (Licht.).

Un mâle de Garita del Sol du 6 avril 1893. "Iris noir, bec blanchâtre, pattes d'un corné grisâtre tachetées de brun."

Fam. CATHARTIDÆ.

+ 402. *CATHARTES AURA PERNIGER* (Sharpe).

Ingapirca, mai 1890.

## Fam. FALCONIDÆ.

## 403. PHALCOBÆNUS MEGALOPTERUS (Meyen).

Baños (avril), San Blas (avril), Ingapirca (mai) et Andores (mai 1890): quatre individus. "Iris brun-marron, cire et visage rouge jaunâtres, pattes d'un jaune orangé. Chez le jeune les pattes sont d'un olive bleuâtre."

## †404. IBYCTER AMERICANUS (Bodd.).

Chanchamayo: un mâle du 5 juin 1891. "Iris rouge-cerise; bec jaune olivâtre; cire et mandibule inférieure à la base d'un plombé bleuâtre; joues et gorge pourprées; pattes d'un orangé rougeâtre."

## 405. CIRCUS CINEREUS (Vieill.).

Ingapirca: deux paires de mai et juin 1890. "Iris jaune, pattes jaunes, cire jaune avec une teinte verdâtre."

## 406. ACCIPITER PILEATUS (Temm.).

La Merced: un oiseau du 10 mars 1891.

## †407. BUTEO PENNSYLVANICUS (Wils.).

Maraynioc: une paire de novembre 1890.

## 408. BUTEO ERYTHRONOTUS (King).

Ingapirca: sept individus de mai et juin 1890. Maraynioc: une femelle du 17 septembre 1892. "Iris brun clair, pattes jaunes, cire jaune verdâtre."

## †409. BUTEOLA BRACHYURA (Vieill.).

La Merced: un jeune mâle du 26 août 1890. "Iris brun-café, bec noir, cire jaune verdâtre; pattes d'un jaune-citron."

## 410. BUTEOLA LEUCORRHOA (Quoy et Gaim.).

Tambo de Aza: une femelle du 16 novembre 1893. "Iris jaune orangé, bec noir, cire jaune verdâtre, pattes d'un jaune sale."

## 411. RUPORNIS NATTERERI (Scl. et Salv.).

La Merced: une paire de juillet et août 1890. "Iris jaune, cire jaune orangé; parties nues autour de l'œil jaune orangé; pattes jaune pale."

## 412. RUPORNIS MAGNIROSTRIS (Gml.).

Borgaña: une femelle du 30 avril 1891.

## 413. GERANOÆTUS MELANOLEUCUS (Vieill.).

Un mâle adulte de Maraynioc du 30 août 1892.

+ 414. *ICTINIA PLUMBEA* (Gm.).

La Merced: un mâle du 31 août 1890. "Iris rouge-cerise, bec noir, pattes d'un carné rosâtre."

+ 415. *REGERHINUS MEGARHYNCHUS* Des Murs.

Garita del Sol: une femelle du 15 août 1891.

+ 416. *HARPAGUS BIDENTATUS* (Lath.).

Borgoña: une femelle du 11 juin 1891.

+ 417. *TINNUNCULUS SPARVERIUS CINNAMOMINUS* (Sw.).

Palcamayo: un mâle de juillet 1890.

+ 418. *HYPOTRIORCHIS FUSCOCÆRULESCENS* (Vieill.).

Ingapirca: trois individus de juin 1890. <sup>33</sup> Pariayacu: une femelle du 12 janvier 1893. "Iris brun foncé; cire, tour de l'œil et pattes jaunes."

## Fam. COLUMBIDÆ.

+ 419. *COLUMBA SPECIOSA* (Gm.).

La Merced: trois mâles du 22 août 1890, du février et avril 1891. "Iris brun foncé, bec rouge avec le bout blanc, pattes couleur framboise sale."

420. *COLUMBA ALBILINEA* Bp.

*Columba albilineata* Tacz. Orn. du Pérou, iii. p. 322.

Maraynioc: deux mâles de juillet et août 1892 et une femelle du 15 décembre 1891. "Iris: anneau extérieur d'un rosé pâle, intérieur mince argenté; bec d'un orangé olivâtre à pointe brune, pattes jaunes."

+ 421. *COLUMBA RUFINA* Temm. et Knip.

La Merced: une paire du 22 août 1890. "Iris couleur de rose, pattes couleur framboise."

422. *COLUMBA PLUMBEA BOGOTENSIS* Berl. et Lev.

*Chlorœnas plumbea* Vieill., subsp. n. *bogotensis* Berl. et Lev. Orn., 1890, p. 32.

*Columba vinacea* (partim) Tacz. Orn. du Pérou, iii. p. 235.

*Columba plumbea* id. ibid. p. 234.

La Gloria: trois mâles adultes d'août 1890 et du 21 février 1891. "Iris jaune rougeâtre, tour de l'œil brun bleuâtre avec de petites taches d'un rouge sale; pattes couleur framboise."

Un œuf a été trouvé par M. Kalinowski à Chanchamayo. La forme de cet œuf est elliptique, la coque d'un blanc tirant un peu sur le jaunâtre. Lustre nul. Dimensions: 34 × 26.25 mm.

Les échantillons de la Gloria ne diffèrent des oiseaux de la Colombie (*C. p. bogotensis* Berl. et Lev.) que par la nuance du dessus et du dessous du corps plus claire, la gorge et la poitrine d'un rouge vineux plus grisâtre et par la queue plus longue. En



cas que ces différences seraient constantes on pourrait séparer ces échantillons comme *C. p. delicata*.

423. GYMNOPELIA ANAIS (Less.).

*Columba erythrothorax* Meyen (1833) nec Temm. (1808-11).

*Gymnopolia erythrothorax* Tacz. Orn. du Pérou, iii. p. 249.

Tarma: une paire du 24 septembre 1890. Hacienda Queta: un mâle et deux femelles de décembre 1892 et d'août 1893. "Iris bleu, tour de l'œil jaune orangé, pattes carnées."

424. COLUMBIGALLINA TALPACOTI (Temm.).

La Merced: trois mâles et deux femelles de juillet et septembre 1890, et mâle et femelle de février et avril 1891. "Iris rouge rosâtre, pattes d'un carné rosâtre."

Nous avons reçu un œuf de ce pigeon de Chanchamayo. Dimensions: 21.25 × 15.75 mm.

425. METRIOPELIA MELANOPTERA (Mol.).

Tarma, Hacienda da Queta: deux mâles et une femelle de décembre 1892 et du 25 juillet 1893.

† 426. LEPTOPTILA RUFAXILLA (Rich. et Bern.).

La Merced et La Gloria: mâle et femelle d'août 1890. "Iris jaune olivâtre."

427. LEPTOPTILA OCHROPTERA Pelz.

La Merced, Chanchamayo: deux mâles de juillet 1890. "Iris jaune rosâtre, tour de l'œil brun bleuâtre avec de petites taches d'un rouge sale, pattes d'un rouge framboise."

Comparés avec un individu du Musée Berlepsch provenant de la province de Rio Janeiro (*L. ochroptera* typique), ces oiseaux ne diffèrent que par le bec un peu plus long, par le brun du dos et des ailes un peu plus clair, par l'éclat améthyste du cou postérieur moins vif, le front un peu plus blanchâtre, la couleur cannelle du dessous de l'aile un peu plus claire. Il serait difficile de les séparer comme sous-espèce.

† 428. GEOTRYGON MONTANA (Linn.).

Un individu pris vivant à Tarma au mois d'avril 1893.

429. GEOTRYGON FRENATA (Tsch.).

Deux femelles de La Merced et de La Gloria, Chanchamayo, août 1900 et 3 février 1891.

Fam. PENELOPIDÆ.

430. PENELOPE BOLIVIANA Reichb.

La Gloria: un mâle du 7 août 1890. "Iris brun foncé, sac gulaire d'un rouge ochreux, pattes d'un rouge sale."

Chanchamayo: une femelle du 5 mai 1891.

† 431. *PENELOPE SCLATERI PLUMOSA*, subsp. nov.

*Penelope sclateri* Ogilvie Grant, Cat. Birds Brit. Mus. xxii. p. 443 partim (Huasampilla); Tacz. Orn. du Pérou, iii. p. 269.

*P. quoad colorem P. sclateri dictæ ex Bolivia maxime affinis, sed gula superiore et tarsi dimidio basali ut in P. montagnii dicta plumosis, necnon plumis pectoris ventrisque superioris magis conspicue argenteo-albo marginatis distinguenda, alis caudaque quoque brevioribus.*

Al. 218, caud. 230, culm. 23, tars. 53 mm.

*Hab.* in Peruvia centrali or. : Maraynioc.

*Typi* in Mus. Branicki et Mus. Berlepschi.

Maraynioc, Pariayacu : un mâle et trois femelles de juillet 1892.

C'est un fait curieux que les oiseaux péruviens du Pérou central (Maraynioc, coll. *Kalinowski*) et du Pérou du sud (Paucarbambo, coll. *O. Garlepp*) ont le haut de la gorge et la moitié basale du tarse emplumé comme chez la *P. montagnii* de la Colombie et du Vénézuëla, tandis que dans la coloration général ils ressemblent plutôt à la *P. sclateri* de la Bolivie. Ils diffèrent aussi des oiseaux boliviens par les plumes de la poitrine et de l'abdomen supérieur plus distinctement bordées de blanchâtre sur un fond plus noirâtre, caractère qu'ils ont aussi en commun avec la *P. montagnii*. Néanmoins ils présentent des bordures blanchâtres très prononcées aux plumes du dessus de la tête, du cou postérieur, du haut du dos et des tectrices susalaires comme chez la *P. sclateri*, bordures qui manquent chez la *P. montagnii*. Le bec est noirâtre comme chez la *P. sclateri* et non jaune rougeâtre comme chez la *P. montagnii*.

Chez la *P. sclateri* de la Bolivie il n'y a que des poils noirâtres sur la gorge, qui deviennent plus larges et plus abondants au menton. C'est pourquoi la gorge paraît presque tout-à-fait nue.

Chez la *P. montagnii* et chez la *P. s. plumosa* tout le haut de la gorge (sur une étendue d'à peu près 45 mm.) est couvert de plumes d'un gris argenté à tiges noires. Chez la dernière le tarse est emplumé du genou jusqu'à peu près la moitié de sa longueur, tandis que chez la *P. sclateri* ce n'est que le tiers basal qui est couvert de plumes.

432. *ORTALIS GUTTATA ADSPERSA* (Tsch.).

*Ortalida guttata* Tacz. Orn. du Pérou, iii. p. 278 partim.

La Merced : une mâle du 13 septembre 1890. "Iris brun foncé, joues brunes, le menton rouge sale tirant sur le jaune, pattes d'un rouge framboise."

Garita del Sol : un mâle adulte du 3 août 1891.

Comparés avec un mâle adulte de Samiria, Amazone supérieur (coll. Hauxwell), du Musée Berlepsch, les échantillons du Pérou central et de la Bolivie paraissent différents par la tête en dessus d'un brun plus grisâtre, moins noirâtre, par les plumes du front bordées d'un blanc grisâtre (ce qui n'est pas le cas chez l'oiseau

de Samiria) et par les plumes du cou inférieur, de la poitrine et des côtés du cou plus distinctement terminées de blanchâtre, enfin par le dos d'un brun plus verdâtre.

Par les bordures blanchâtres du front cette forme paraît se rapprocher de l'*O. caracco* Wagl. de la Colombie, espèce que nous ne connaissons pas.

433. *CHAMÆPETES RUFIVENTRIS* (Tsch.).

Garita del Sol: deux mâles adultes du juin 1891.

434. *ABURRIA ABURRI* (Less.).

Garita del Sol: un mâle adulte du 4 août 1891.

Ils paraît que les oiseaux péruviens (♂ ad. de Tambillo et deux ♀ adultes de Cuzco, coll. *O. Garlepp*) ont les dimensions plus petites qu'un oiseau de l'Équateur oriental. En outre ils présentent l'éclat métallique plus verdâtre au dos et au bas du cou.

Fam. PHASIANIDÆ.

435. *ODONTOPHORUS SPECIOSUS* Tsch.

Garita del Sol: deux mâles adultes du juin et juillet 1891. "Iris brun de café, bec noir, pattes d'un plombé bleuâtre."

Fam. TINAMIDÆ.

436. *TINAMUS TAO* Temm.

*Tinamus kleei* (Tsch.) Tacz. Orn. du Pérou, iii. p. 293.

La Gloria: un mâle du 8 août 1890 et une femelle du 3 février 1891. "Iris brun foncé, mandibule supérieure noire, l'inférieure couleur de rose brunâtre; pattes d'un plombé bleuâtre."

437. *CRYPTURUS OBSOLETUS* (Temm.).

La Gloria: deux mâles du 3 février 1891. La Garita del Sol: un mâle du 20 août 1891. "Iris jaune brunâtre, bec noir à mandibule inférieure plus pâle, pattes olivâtres."

438. *CRYPTURUS TATAUPA* Temm.

La Merced: trois individus de juillet et août 1890 et une femelle du 23 mai 1891. "Iris chez le mâle rouge, chez la femelle rouge sale, bec rouge clair; pattes couleur framboise sale, ongles jaunes."

Al. 131-127½, caud. 47½-45, culm. 24¼-23½, tars. 33-32½ mm.

Ces oiseaux paraissent identiques à un individu de Tucuman (recueilli par Borelli), néanmoins ils ont le dos et les tectrices susalaires d'un brun plus rougeâtre et plus intense, le bec d'un jaune uniforme sans pointe noirâtre et le piléum d'un noirâtre plus intense. Le type de Temminck venait du Brésil méridional. Peut-être les oiseaux de Brésil ont-ils le bec plus court.

439. *NOTHOPROCTA BRANICKII* Tacz.

Baños : un mâle du 29 avril 1890 comparé avec le type du Muséum de Varsovie. "Iris brun rougeâtre."

Tarma, Hacienda de Queta : un mâle du 8 juillet 1893.

440. *NOTHOPROCTA TACZANOWSKII* Scl. et Salv.

Maraynioc, Pariayacu : deux mâles du 29 novembre 1891 et du 1 août 1892. "Iris rouge-brique pâle, bec brun, pattes d'un jaune pâle."

Fam. PHALACROCORACIDÆ.

† 441. *PHALACROCORAX VIGUA* (Vieill.).

Ingapirca : une jeune femelle de juin 1890. "Iris vert, bec carné grisâtre avec la ligne médiane noirâtre, la mandibule inférieure à la base jaune."

La Merced : une femelle du 14 janvier 1891.

Fam. IBIDIDÆ.

† 442. *PLEGADIS RIDGWAYI* (Allen).

Baños et Ingapirca : trois individus d'avril et mai 1890. "Iris rouge, bec brun rougeâtre, pattes noires. Iris chez le jeune brun."

♂ semiad. Al. 296, caud. 127, culm.  $123\frac{1}{2}$ , tars.  $86\frac{1}{2}$  mm.

♂ juv. " 284 $\frac{1}{2}$ , " 111, " 80 $\frac{1}{2}$ , " 79 "

♀ juv. " 257, " 104, " 70 $\frac{1}{2}$ , " 66 "

443. *THERISTICUS BRANICKII* Berl. et Stolz.

*Theristicus branickii* Berl. et Stolz. Ibis, 1894, p. 404 (descrip. orig.); Salvad. Ibis, 1900, pp. 501-517, pls. ix., x.

*Theristicus caudatus* Tacz. (nec Bodd.) Orn. du Pérou, iii. p. 417, part.

Maraynioc, Pariayacu : deux mâles adultes et une femelle adulte recueillis le 22 décembre 1891 et le 13 octobre 1892. "Iris d'un rouge sale, bec brun, d'un plombé verdâtre à l'extrémité; les parties nues d'un brun noirâtre; pattes rouges."

Fam. ARDEIDÆ.

† 444. *LEUCOPHOYX CANDIDISSIMA* (Gm.).

Ingapirca : une femelle du 9 mai 1890. "Iris jaune, bec noir avec la base jusqu'aux yeux jaune orangé; pattes d'un olive jaunâtre avec les doigts et le talon d'un jaune olivâtre."

† 445. *HERODIAS EGRETTE* (Gm.).

Ingapirca : un mâle de juin 1890. "Iris jaune, bec jaune-orange, pattes noires."

† 446. *NYCTICORAX NYCTICORAX OBSCURUS* (Bp.).

Ingapirca : trois individus de mai et juin 1890. "Iris rouge,

bec noir avec la mandibule inférieure en dessous jaune verdâtre ; pattes jaunes lavées de verdâtre, doigts brunâtres."

La Merced : une paire d'oiseaux jeunes de mars 1891. Jauja : un oiseau jeune du 19 juillet 1893.

Les œufs sont d'un vert bleuâtre pâle. La forme varie beaucoup même dans la même ponte. Il y a des œufs ovoïdes, courts et assez bombés, d'autres sont oblongs et presque elliptiques. Il y en a un qui a la forme d'une poire allongée.

Les dimensions par pontes :—

1°.	2°.	3°.
50·50 × 37·50	55 × 37·50	57·50 × 38·50
50 × 39·25	56·25 × 36	56·25 × 39 mm.
(carré)	(avorton)	

447. *TIGRISOMA SALMONI* Sel. et Salv.

La Merced : un mâle adulte du 27 mars 1891. "Iris jaune olive brunâtre; bec noir corné, les sourcils, une mince raie devant l'œil et parties nues sur la mandibule inférieure d'un jaune olivâtre. Mandibule inférieure à la base et en dessous d'un bleu clair; pattes d'un plombé brunâtre en avant, d'un gris verdâtre en arrière.

Fam. RALLIDÆ.

448. *RALLUS RYTHIRHYNCHUS* Vieill.

Ingapirca : mai et juin 1890.

† 449. *RALLUS NIGRICANS HUMILIS*, subsp. nov.

*Rallus nigricans* Tacz. Orn. du Pérou, iii. p. 317.

*R. R. nigricans dicto simillimus, sed minor, rostro imprimis multo brevior et gracilior; pileo anteriore clariore plumbeo, corpore superiore reliquo occipiteque pallidius olivaceo-brunneis (nec oleagineo-brunneis), gula albescentiore, necnon tectricibus subalaribus intensius nigris (nec brunneo-nigris) apice albescente marginatis, distinguendus.*

♀. Al. 126, caud. 57, culm. 43½, tars. 40½ mm.

*Hab.* in Peruvia centrali orientali : Chanchamayo.

*Typus* in Mus. Branicki. ♀ La Merced, Chanchamayo (J. Kalinowski, legit no. 1123).

La Merced : une femelle du 30 janvier 1891. "Iris rouge, bec vert teinté de jaune à la base, pattes d'un rouge sale pâle."

Comparé à deux oiseaux de Sta. Catharina et un autre d'Antioquia, la femelle de La Merced présente des dimensions beaucoup plus petites, surtout le bec plus court et plus effilé; la partie antérieure du piléum d'un gris plombé plus pur et plus bleuâtre, les côtés de la tête également d'un plombé plus bleuâtre, la gorge plus blanchâtre; les parties supérieures du corps jusqu'à l'occiput d'un brun-olive plus clair ou moins oléagineux; enfin les tectrices sousalaires d'un noirâtre plus intense (moins brunâtre) et bordées à la pointe de blanchâtre.



## 450. ARAMIDES CAYANEA CHIRICOTE (Vieill.).

*Aramides cayannensis* (Gml.), Tacz. Orn. du Pérou, iii. p. 318.

La Merced : une femelle du 19 juillet 1890. "Iris rouge, bec d'un jaune olivâtre pâle avec le bout bleu de ciel, tour de l'œil rouge; pattes d'un rouge sale."

## 451. CRECISCUS VIRIDIS SUBRUFESCENS Berl. et Stolz., subsp. nov.

[*Rallus viridis* Müll. 1776.]

[*Rallus cayanensis* Bodd. 1783.]

*Porzana cayannensis* Tacz. Orn. du Pérou, iii. p. 323.

*C. C. viridis dicto ex Cayenne affinis, differt corpore subtus pallide fulvescenti-rufo nec castaneo, gula fere albescente, pileo pallidiore rufo, necnon corpore superiore clariore griseo-olivaceo (nec brunnescenti-olivaceo), tectricibus subalaribus pallide rufescentibus nec rufo-brunneis.*

		Al.	Caud.	Culm.	Tars.
La Merced.	♂ ♂.	87-86	31	17 $\frac{3}{4}$	35 $\frac{1}{2}$ mm.
"	♀.	90	37	—	36 "
Huayabamba.	Adult.	91	32 $\frac{1}{2}$	19	36 $\frac{1}{2}$ "

*Hab.* in Peruvia orientali (septentrionali et centrali).

*Typus* in Mus. Branicki: ♂. La Merced, Chanchamayo.

La Merced : trois individus d'août 1890.

Les oiseaux de La Merced (Mus. Branicki) et de Huayabamba (coll. Garlepp—Mus. Berlepsch) se distinguent des échantillons de Cayenne par les parties inférieures du corps d'un roux beaucoup plus pâle, par la gorge presque blanchâtre au lieu de roussâtre, le milieu du ventre plus pâle (blanchâtre chez les oiseaux de La Merced), par le roux du piléum plus clair et moins intense, enfin par les parties supérieures du corps d'un olive plus clair, plus grisâtre au lieu de brunâtre. Les échantillons des collections de Bogotá (Musée Berlepsch) s'accordent en général avec les péruviens, mais ils semblent avoir les côtés de la tête d'un gris plus roussâtre et les parties supérieures du corps d'un brun roussâtre ou d'un olive roussâtre au lieu d'un olive grisâtre.

Les oiseaux de Bahia (Musée Berlepsch) présentent les parties inférieures du corps et le piléum d'un roux châtain encore plus intense que les oiseaux de Cayenne. Peut-être qu'on pourrait les séparer sous la dénomination de *P. viridis pileata* (Wied).

D'après les remarques du docteur Sharpe (Cat. Birds, xxiii. p. 145) il paraît que *Crex facialis* Tschudi serait un jeune du *C. viridis subrufescens*, mais il est impossible d'en juger d'après la description de M. Tschudi.

## 452. CRECISCUS MELANOPHEUS (Vieill.).

La Merced : un mâle du 26 août 1890. "Iris brun bleuâtre, bec noir avec les côtés et la base verts, un peu jaunâtres; pattes olives."

Al. 85, caud. 45, culm. 19 $\frac{1}{4}$ , tars. 32 $\frac{1}{2}$  mm.

Cet individu se distingue des échantillons de Bahia du Musée Berlepsch par les ailes et la queue plus longues, par les parties supérieures du corps d'un brun-olive plus verdâtre, par le front mêlé de plumes d'un brun roussâtre et par la présence d'une strie roussâtre au-dessus des freins qui est d'un blanc sâle chez les oiseaux de Bahia. L'espace derrière l'œil est également d'un brun roussâtre au lieu d'un brun-olive concolore au dos. Le croupion est d'un brun noirâtre plus foncé et les rectrices sont d'un noirâtre plus intense. Pour vérifier ces différences il faudrait plusieurs individus du Pérou pour comparer. Peut-être que l'oiseau péruvien fait le passage du *C. melanophæus* au *C. œnops* (Scl. et Salv.) de l'Ecuador oriental.

Espèce nouvelle pour la faune péruvienne.

#### 453. FULICA ARDESIACA Tsch.

Ingapirca: trois mâles de mai 1890. "Iris rouge, bec avec la scutelle frontale d'un blanc un peu plombé; pattes d'un plombé pâle."

Les œufs au nombre de 11 de Junin ressemblent absolument par la forme et la coloration aux œufs de la Foulque d'Europe (*Fulica atra*). Ils sont seulement plus grands.

Dimensions:—

63.50 × 41; 65 × 38; 60.25 × 39.50; 61 × 38; 64 × 38; 61.25 × 40; 59.25 × 39.50; 59.50 × 40; 60.75 × 39.50; 61 × 41; 62 × 40 mm.

#### 454. FULICA GIGANTEA Eyd. et Soul.

Ingapirca: une femelle du 10 mai 1890. "Iris brun clair, bec brun rougeâtre avec le bout même jaune olivâtre, scutelle frontale au milieu blanc olivâtre, sur les côtés jaune, pattes d'un brun rougeâtre avec une teinte olivâtre."

#### +455. GALLINULA GALEATA (Licht.).

Ingapirca: deux paires de mai et juin 1890. "Iris brun cendré, bec et scutelle frontale rouges, le quatre terminal du bec jaune verdâtre, anneau sur les tibias d'un rouge cinnabre."

### Fam. EURYPYGIDÆ.

#### +456. EURYPYGA MAJOR MERIDIONALIS, subsp. nov.

*E. E. major dictæ ex America centrali maxime affinis, differt fasciis dorsi superioris nigris multo angustioribus et minus clare definitis, collo superiore dorsoque magis conspicue rufescente radiatis vel irroratis, necnon ventre medio purius albo, minus fulvo tincto.*

♂. Al. 237, caud. 161, culm. 61, tars. 53½ mm.

♀. " 215, " 144, " 55½, " 56½ "

*Hab.* in Peruvia centrali; La Merced, Chanchamayo.

*Typus* in Mus. Branicki: ♂. La Merced le 23 mars 1891, no. 1195.

La Merced: une paire des 23 et 28 mars 1891. "♂. Iris rouge de sang, bec brun en dessus, le bord de la mandibule supérieure et toute la mandibule inférieure d'un orangé ochreux. ♀. Iris d'un rouge orangé, mandibule inférieure orangé olivâtre; pattes d'un jaune brunâtre."

Les échantillons de Chanchamayo ont la même taille que les oiseaux de Bogotá et de Costa Rica (*E. major* Hartl.). Ils diffèrent néanmoins par les bandes noirâtres du dos supérieur beaucoup plus étroites et par le dos supérieur et la nuque plus distinctement rayés d'un roux roussâtre, plus clair que chez la *P. major* typique. Le milieu du ventre paraît plus blanchâtre, moins roussâtre.

Enfin chez les oiseaux péruviens il y a une bande d'un roux châtain sur la première rémige qui manque chez l'oiseau de Costa Rica, tandis qu'il y en a deux chez un oiseau de Bogotá du Musée Berlepsch.

#### Order GRALLÆ.

##### 457. OREOPHILUS RUFICOLLIS (Wagl.).

Entre Tarma et Oroya: une femelle du 24 septembre 1890. "Iris noire, pattes rosés."

##### 458. PTILOSCELIS RESPLENDENS (Tsch.).

Ingapirca: deux paires de mai 1890. Maraynioc: une femelle du 6 juillet 1892. "Iris rouge-cerise; bec à la base rouge rosâtre, le reste noir; pattes d'un rouge carné."

##### 459. ÆGIALITIS COLLARIS (Vieill.).

La Merced: trois individus de juillet et août 1890, "iris brun foncé"; et une femelle et un oiseau sans indication de sexe du 31 janvier 1891.

##### 460. ÆGIALITIS ALTICOLA, sp. nov.

*Ægialitis occidentalis* Sharpe (nec Cab.), Cat. Birds Brit. Mus. vol. xxiv. (1896) p. 295 (Tarapacá).

*Æ. Æ. falklandica dictæ maxime affinis, sed minor, rostro imprimis debiliore et brevior, corpore subtus fere unicolore albo, nec fasciis duabus latis nigris instructo, pectoris lateribus solummodo fusco maculatis et fascia infra-pectoralis interrupta e maculis fuscis vel rufescentibus composita prædito, corpore supra tectricibusque alarum superioribus pallidius griseo-brunneis, necnon fasciis indistinctis pilei medii nuchæque capitisque lateribus pallidius rufescentibus distinguenda*

♀ ♀. AL.  $123\frac{1}{2}$ –121, caud. 54–53, culm.  $14\frac{3}{4}$ , tars.  $28\frac{1}{2}$ – $25\frac{3}{4}$  mm. *Hab.* in Peruvia alta.

*Typus* in Mus. Branicki: ♀. Ingapirca, J. Kalinowski, legit no. 518.

Ingapirca : deux femelles du 13 mai 1890. " Iris brun foncé, bec et pattes noirs."

Cette nouvelle *Ægialitis* paraît le plus voisine de l'*Æ. falklandica* (Lath.) d'Argentine et du Chili, dont elle ne diffère que par les dimensions plus petites surtout le bec plus petit et plus faible, et par le manque presque complet des deux larges bandes noires sous la gorge et à la poitrine inférieure. Ces bandes ne sont indiquées que par de petites taches noirâtres aux côtés extrêmes de la poitrine et par une sorte de bande très peu marquée, composée de petites taches noirâtres ou roussâtres très pâles sur la poitrine inférieure. Les parties supérieures du corps et les tectrices sousalaires sont d'un gris-brun plus pâle et le roussâtre des bandes au piléum et à la nuque et des côtés de la tête est plus pâle. Enfin les tarses et les pieds sont d'un noir profond au lieu de brunâtres.

Berlepsch ayant examiné le type de l'*Æ. occidentalis* Cab. au Musée de Berlin, provenant du Chili, a pu se convaincre qu'il appartient à l'espèce plus petite à pieds jaunâtres, à grandes taches noires sur chaque côté de la poitrine et à bande noire céphalique très large, savoir l'*Æ. nivosa* Cass. ou à une sous-espèce très peu distincte qu'on pourrait nommer l'*Æ. nivosa occidentalis* Cab.

M. Sharpe, dans le Catalogue du Musée Britannique, n'a pas séparé les oiseaux chiliens de l'*Æ. nivosa* Cass.

D'autre part les oiseaux de Tarapacá à pieds noirs qu'il décrit sous la dénomination de l'*Æ. occidentalis* Cab. appartiennent probablement à notre *Æ. alticola*.

461. HIMANTOPUS MEXICANUS (P. L. S. Müll.).

Ingapirca : trois oiseaux de mai 1890. " Iris rouge, bec noir, pattes rouge rosâtres."

462. RECURVIROSTRA ANDINA Philippi et Landb.

Ingapirca : un mâle du 19 mai 1890. " Iris rouge, bec noir corné, pattes d'un plombé bleuâtre."

463. TOTANUS MELANOLEUCUS (Gm.).

Ingapirca : quatre femelles de mai 1890. " Iris brun foncé, pattes d'un jaune sale."

464. TOTANUS FLAVIPES (Gm.).

Ingapirca : deux femelles de mai. La Merced : de septembre 1890. " Iris brun foncé, pattes d'un jaune olivâtre."

465. HELODROMAS SOLITARIUS (Wils.).

La Merced : un mâle du 21 mars 1891.

466. TRINGOIDES MACULARIUS (Linn.).

La Merced : août et septembre 1890, et un mâle du 23 mars 1891. " Iris brun foncé."

467. HETEROPYGIA MACULATA (Vieill.).

Ingapirca : quatre individus de mai 1890. " Iris brun foncé,

bec à la base brun jaunâtre, vers le bout noir, pattes d'un jaune olivâtre."

468. *GALLINAGO PARAGUALE* (Vieill.).

La Merced : un mâle adulte du 21 mars 1891 (juillet?). "Iris brun foncé, bec olive grisâtre dans sa partie basale, noir dans la partie terminale; pattes d'un olive verdâtre."

Al. 125, caud.  $52\frac{1}{2}$ , culm.  $73\frac{1}{2}$ , tars.  $35\frac{1}{2}$  mm.

Cet oiseau ne diffère des oiseaux du Paraguay et de Rio Grande do Sul que par le bec, les tarses et les doigts un peu plus longues et par le plumage généralement plus blanchâtre. Les bordures des plumes du dos et des scapulaires sont plus blanchâtres, les maculatures du cou inférieur et de la poitrine plus brunâtres moins noirâtres, les souscaudales moins variées de maculatures noirâtres.

469. *GALLINAGO ANDINA* (Tacz.).

Ingapirca : cinq individus de mai et juin 1890. "Iris brun foncé; bec brun foncé dans sa partie terminale, carné brunâtre à la basale; pattes jaunes."

470. *GALLINAGO JAMESONI* (Bp.).

Maraynioc, Parrayacu et Maláo : un mâle adulte et une femelle adulte du 7 août 1892 et du 26 novembre 1891. "Iris brun noirâtre et brun foncé, bec brun carné, pattes d'un gris pâle."

♂. Al.  $158\frac{1}{2}$ , caud. 52, culm.  $90\frac{1}{2}$ , tars.  $38\frac{1}{2}$  mm.

♀. " 160, " 62, "  $91\frac{1}{2}$ , "  $40\frac{1}{2}$  "

+ 471. *STEGANOPUS TRICOLOR* (Vieill.).

Ingapirca : un jeune mâle en plumage de transition de mai 1890. "Iris brun foncé, bec noir, pattes d'un brun jaunâtre."

472. *THINOCORUS ORBIGNYANUS* Geoffr. et Less.

Baños : trois individus d'avril et mai 1890. Hacienda Queta : un mâle du 19 juillet 1893. "Iris brun, bec à la base et pattes d'un jaune orangé."

Fam. LARIDÆ.

473. *LARUS SERRANUS* Tsch.

Ingapirca : trois individus de mai 1890. "Iris brun foncé, bec et pattes d'un brun rougeâtre, tour de l'œil rouge."

Fam. PHŒNICOPTERIDÆ.

474. *PHŒNICOPTERUS CHILENSIS* Mol.

*Ph. ignipalliatu*s d'Orb. et Geoffr. St. Hil., Tacz. Orn. du Pérou, iii, p. 432.

Ingapirca : six oiseaux de mai et juin 1890. "Iris blanc jaunâtre; bec dans la moitié basale blanc rosâtre, dans la moitié



terminale noir; pattes d'un olive très clair, doigts avec la membrane et l'articulation tarso-tibienne d'un rouge rosâtre."

Les œufs sont d'un blanc jaunâtre. La forme est presque elliptique, quoique on voit un certain amincissement vers le petit bout. La coque est médiocrement rugueuse et âpre au toucher.

La granulation, quoique visible à l'œil nu, est comme émousée; en général la coque possède un certain lustre. Les dimensions de la seule ponte envoyée par M. Kalinowski de Junin sont  $76 \times 52.50$ ,  $76 \times 52$  mm.

#### Fam. ANATIDÆ.

##### 475. CHLOËPHAGA MELANOPTERA (Eyt.).

*Bernicla melanoptera* Tacz. Orn. du Pérou, iii. p. 467.

Ingapirca: deux paires de mai et juin 1890. "Iris noir, bec d'un rosé un peu bleuâtre, pattes rouges."

##### 476. ANAS CRISTATA Gm.

Maraynioc: un mâle du 30 juin 1892. "Iris orangé, bec d'un bleu brunâtre, mandibule inférieure d'un ochracé rougeâtre. Pattes d'un brun grisâtre.

##### 477. NETTION OXYPTERUM (Meyen).

Ingapirca: deux paires de mai et juin 1890. "Iris brun foncé; bec jaune avec la ligne médiane et le bout de la mandibule supérieure noirs; pattes d'un plombé brunâtre."

##### 478. DAFILA SPINICAUDA (Vieill.).

Ingapirca: trois individus de mai 1890. "Iris brun foncé; les parties supérieures du bec noires, les côtés à la base jaunes, vers le bout bleu de ciel avec le bord noir; pattes d'un brun grisâtre."

##### 479. QUERQUEDULA PUNA (Tsch.).

Ingapirca: quatre individus de mai 1890 "Iris brun rougeâtre."

Les œufs, au nombre de cinq, ont été trouvés par M. Kalinowski à Junin. Ils sont d'une forme ovale, assez allongés. La couleur est roussâtre pâle à peu près de la teinte des variétés foncées des œufs de la poule domestique. La grandeur est plus ou moins celle des œufs du canard sauvage (*Anas boschas*).

Dimensions:  $56.50 \times 38$ ;  $56 \times 37.25$ ;  $57 \times 37.50$ ;  $57.75 \times 38.50$ ;  $57.25 \times 38.25$  mm.

##### 480. ERISMATURA FERRUGINEA Eyton.

Ingapirca: une femelle du 27 mai 1890. "Iris brun foncé, bec et pattes d'un noir brunâtre."

##### 481. MERGANETTA LEUCOGENYS (Tsch.).

Acobamba: une femelle du 11 juillet 1890. Maraynioc: une femelle du 14 novembre 1892. "Iris brun foncé, bec rouge de sang avec la partie supérieure noirâtre, pattes d'un rouge sale."

## Fam. PODICEPIDÆ.

## 482. PODICEPS AMERICANUS Garnot.

*P. rollandi* Tacz. (nec Quoy et Gaim.) Orn. du Pérou, iii. p. 494.

Ingapirca: six individus de mai et juin 1890. "Iris d'un rouge vif avec un dessin noir; bec noir; pattes dans leur partie intérieure olives, extérieurement brunes. Chez le jeune le bec est d'un brun clair avec la mandibule inférieure brun jaunâtre; pattes d'un olive brunâtre."

Les oiseaux adultes sont un peu plus grands, à bec un peu plus long qu'un mâle adulte de Punta Arenas (Magellan) du Musée Berlepsch. Il paraît aussi que le mâle de Punta Arenas a le blanc plus répandu aux rémiges secondaires et aux barbes internes des primaires.

♂. Ingapirca	Al. $116\frac{1}{4}$ ,	culm. $23\frac{1}{2}$ ,	tars. 39	mm.
♀. " "	" 114,	" 20- $19\frac{1}{2}$ ,	" 37 $\frac{1}{2}$ -35	"
♂ ad. Punta Arenas	" 112,	" 18 $\frac{1}{2}$ ,	" 36	"

Deux œufs de Junin sont fusiformes, c'est-à-dire très allongés et également et fortement atténués aux deux bouts. La couleur est blanche sale, suffusée en grande partie d'un roussâtre pâle qui provient d'une matière colorante étrangère. Dimensions:  $49 \times 29$ ;  $48 \times 29.50$  mm.

## 483. PODICEPS TACZANOWSKII Berl. et Stolzm.

*Podiceps taczanowskii* Berl. et Stolzm. Ibis, 1894, p. 109, pl. iv. (descr. orig.).

*Podiceps caliparaeus* Tacz. (nec Less. et Garn.) Orn. du Pérou, iii. p. 493 partim.

Ingapirca (lacus Junin): trois paires de mai 1890. Maraynioc: un mâle du 11 juillet 1892. "Iris rouge clair, bec gris clair, pattes d'un olivâtre plombé dans leur partie intérieure et d'un gris brunâtre extérieurement."

Deux œufs ont été obtenus à Junin par M. Kalinowski. Ils ont la forme des œufs des Plongeurs en général, seulement ils sont un peu moins oblongs. La coque est blanche sale colorée ça et là par une matière étrangère d'un rosâtre pâle. Dimensions:  $47 \times 33$ ,  $75.47 \times 33.50$  mm.

*Notes relatives à la première partie de cet article.*

No. 9. *Myiadestes leucotis* (Tsch.), P.Z.S. 1896, p. 327, serait *Entomodestes leucotis* (Tsch.) (gen. *Entomodestes* Stejn. Pr. U.S. Nat. Mus. v. p. 456 note).

No. 14. *Troglodytes frater* Sharpe, l. c. p. 328, serait *Troglodytes solstitialis macrourus* Berl. et Stolzm., subsp. nov. :—

T. a T. solstitialis dicto cauda multo longiore et stria superciliaris pallidiora a T. frater dicto, cui longitudine caudæ cernulæ, stria superciliaris pallide rufescenti nec albo, gula cum pectore

*lateribusque colli latius rufescentibus necnon abdomine magis albo distinguendus.*

♂ ♂ ad. Al.  $53\frac{3}{4}$ –52, caud.  $40\frac{1}{2}$ – $39\frac{1}{2}$ , culm.  $13\frac{1}{2}$ – $13\frac{1}{4}$ , tars.  $19\frac{1}{2}$ – $18\frac{3}{4}$  mm.

*Hab.* in Peruvia centrali.

*Typus* in Mus. Branicki.

Cette forme nouvelle paraît justement intermédiaire entre le *T. solstitialis* de la Colombie et le *T. frater* Sharpe de la Bolivie. Elle a la queue aussi longue que le *T. frater*, c'est-à-dire beaucoup plus longue que le *T. solstitialis*. Elle diffère néanmoins du *T. frater*, ayant la strie sourcilière d'un roussâtre pâle, un peu plus pâle que chez le *T. solstitialis* au lieu d'être d'un blanc pur comme chez le *T. frater*. Elle diffère des deux formes connues par le milieu de l'abdomen d'un blanc ne contrastant pas visiblement avec la couleur roussâtre de la gorge et du haut de la poitrine, tandis que chez le *T. solstitialis* et le *T. frater* le blanc de l'abdomen est plus ou moins lavé de roussâtre. Le *T. frater* a généralement la gorge d'un roussâtre plus pâle et les parties supérieures du corps d'un brun plus foncé, moins roussâtre.

- No. 54. *Arbelorhina caerulea microrhyncha* (Berl.) l. c. p. 337, serait *Cyanerpes caerulea microrhynchus* (Berl.) (gen. *Cyanerpes* Oberh. Auk, 1899, p. 32).
- No. 59. *Chlorophonia torrejoni* Tacz. l. c. p. 338, serait probablement la même que *Chl. longipennis* (Du Bus).
- No. 66. *Calliste chilensis* (Vig.) l. c. p. 339, serait *Calospiza chilensis* (Vig.) (le genre *Calliste* est préoccupé par *Calospiza*).
- No. 67. *Calliste schranki* (Spix) l. c. p. 339, serait *Calospiza schranki* (Spix).
- No. 68. *Calliste xanthogastra rostrata* Berl. et Stolz. l. c. p. 339, serait *Calospiza xanthogastra rostrata* (Berl. et Stolz.).
- No. 69. *Calliste punctulata* Scl. et Salv. l. c. p. 340, serait *Calospiza punctulata* (Scl. et Salv.).
- No. 70. *Calliste pulchra* (Tsch.) l. c. p. 340, serait *Calospiza pulchra* (Tsch.).
- No. 71. *Calliste gyroloides* (Lafr.) l. c. p. 340, serait *Calospiza gyroloides* (Lafr.).
- No. 72. *Calliste fulvicervix* Scl. et Salv. l. c. p. 340, serait *Calospiza fulvicervix* (Scl. et Salv.).
- No. 73. *Calliste argentea* (Tsch.) l. c. p. 340, serait *Calospiza argentea* (Tsch.).
- No. 74. *Calliste boliviana* (Bp.) l. c. p. 340, serait *Calospiza boliviana* (Bp.).
- No. 75. *Calliste nigricincta* (Bp.) l. c. p. 341, serait *Calospiza nigricincta* (Bp.).
- No. 76. *Calliste nigriviridis berlepschi* (Tacz.) l. c. p. 341, serait *Calospiza nigriviridis berlepschi* (Tacz.).

- No. 77. *Calliste cyanicollis* (Lafr. et d'Orb.) l. c. p. 341, serait *Calospiza cyanicollis* (Lafr. et d'Orb.).
- No. 78. *Calliste parzudakii* (Lafr.) l. c. p. 341, serait *Calospiza parzudakii* (Lafr.).
- No. 79. *Calliste melanotis* Sel. l. c. p. 341, serait *Calospiza melanotis* (Sel.).
- No. 80. *Calliste xanthocephala* (Tsch.) l. c. p. 341, serait *Calospiza xanthocephala* (Tsch.).
- No. 133. *Pseudochloris lutea* (Lafr. et d'Orb.) l. c. p. 351, serait *Pseudochloris chloris* (Tsch.) subsp.
- No. 138. *Ammodromus peruanus* (Bp.) l. c. p. 353, serait *Myiospiza peruana* (Bp.) (gen. *Myiospiza* Ridgw. Auk, 1898, p. 224).
- No. 156. *Ochthæca jelskii spodionota* Berl. et Stolz. l. c. p. 356, serait *Ochthæca pulchella* Sel. et Salv.

Berlepsch ayant examiné le type de l'*O. pulchella* Sel. et Salv. au Musée Britannique a pu constater que c'est un jeune oiseau qui ne présente qu'une bordure jaune très étroite au front, qui néanmoins est présente, mais dont Messrs. Sclater et Salvin n'ont pas fait mention en décrivant cette espèce.

En attendant Berlepsch a reçu quatre oiseaux adultes recueillis par M. O. Garlepp dans les Yungas occidentales de la Bolivie et après les avoir comparés avec les échantillons du Pérou central a trouvé qu'ils ne diffèrent dans aucun détail. Ils faudra donc réunir l'*O. jelskii spodionota* au *O. pulchella*. L'*O. jelskii* du Pérou du nord occidental diffère dans quelques détails de coloration et pourrait être distingué comme *O. pulchella jelskii* (Tacz.).

- No. 206. *Myiobius fulvularis* Salv. et Godm. l. c. p. 366, serait mieux nommé *M. erythrurus fulvularis* (Sel. et Salv.).
- No. 279. *Pyriglena maura picea* (Cab.) l. c. p. 383. La différence indiquée relativement aux dimensions de la *P. maura* et de la *T. picea* n'est pas constante.

#### CONCLUSIONS.

M. Kalinowski a donc rapporté des environs de Junin, de la vallée de Chanchamayo et de celle de Vitoc (les deux situées dans le département de Junin) des individus représentant 483 espèces d'oiseaux.

Pour compléter la liste des espèces d'oiseaux qui se trouvent dans ces contrées nous ajoutons une spécification des espèces, qui y ont été trouvées par feu Constantin Jelski et d'autres voyageurs, mais qui ont échappé aux recherches de M. Kalinowski.

1. *Catharus fuscater* (Lafr.).—Chilpes (Jelski).
2. *Turdus crotoperus* Licht.—Amable-Maria (Jelski) (peut-être = *T. phaeopygus spodiolaemus* Berl. et Stolz.?).



3. *Turdus leucops* Tacz.—Ropaybamba (Jelski).
4. *Microcerculus bicolor* Des Murs.—Amable-Maria (Jelski).
5. *Basileuterus tristriatus* (Tsch.).—Auquimarca, Ropaybamba (Jelski).
6. *Diglossa sittoides* (Lafr. et d'Orb.).—Auquimarca, Pumamarca (Jelski).
7. *Hylophilus ferrugineifrons* Scl.—Amable-Maria (Jelski).
8. *Creurgops verticalis* Scl.—Ropaybamba (Jelski).
9. *Trichothraupis melanops* (Vieill.).—Amable-Maria, Ropaybamba, Pumamarca (Jelski).
10. *Nemosia pectoralis* Tacz.—Acancocha (Jelski).
11. *Chlorospingus ignobilis* Scl.—Pumamarca (Jelski).
12. „ *berlepschi* Tacz.—Ropaybamba (Jelski).
13. *Microspingus trifasciatus* Tacz.—Maraynioc (Jelski).
14. „ *Buarremon*” *mystacalis* Tacz.—Ninarupa (Jelski).
15. *Ochthodietta signata* Tacz.—Auquimarca, Ninabamba (Jelski).
16. *Cnipolegus anthracinus* Cab.—Huanta, Higos (Jelski).
17. *Muscisaxicola grisea* Tacz.—Maraynioc (Jelski).
18. *Capsiempis orbitalis* Cab.—Amable-Maria (Jelski).
19. *Pogonotriccus ophthalmicus* Tacz.—Amable-Maria, Ropaybamba (Jelski).
20. *Tyranniscus nigricapillus* (Lafr.).—Pumamarca (Jelski).
21. „ *cinereiceps* Scl.—Ropaybamba (Jelski).
22. „ *viridiflavus* (Tsch.).—? Paltaypampa, Amable-Maria (Jelski).
23. *Rhynchocyclus fulvipectus* Scl.—Ropaybamba (Jelski).
24. „ *peruvianus* Tacz. „
25. *Myiobius villosus* Scl.—Amable-Maria (Jelski).
26. „ *superciliaris* Tacz.—Ropaybamba (Jelski).
27. *Pachyrhamphus viridis* (Vieill.).—Amable-Maria (Jelski).
28. *Doliornis sclateri* Tacz.—Maraynioc (Jelski).
29. *Upucerthia pallida* Tacz.—Junin (coll. Raimondi).
30. *Cinclodes palliatus* (Tsch.).—Vitoc (Tschudi), Ninarupa (Jelski).
31. *Leptasthenura andecola* Scl. et Salv.—Ninarupa (Jelski).
32. *Synallaxis curtata* Scl.—San Bartolomé (Jelski).
33. *Siptornis virgata* (Tacz.).—Junin (Jelski).
34. *Automolus striaticeps* Tacz.—Chilpes (Jelski).
35. „ *ochroleucus* (Tsch.).—Amable-Maria (Jelski).
36. *Philydor montanus* (Tsch.).—Maraynioc (Jelski).
37. *Anabazenops rufosuperciliatus cabanisi* Tacz.—Pumamarca (Jelski).
38. *Dysithamnus ardesiacus* Scl. et Salv.—Amable-Maria (Jelski).
39. *Myrmotherula atrogularis* Tacz.—Amable-Maria (Jelski).
40. „ *menetriesi* d'Orb.—Amable-Maria (Jelski).
41. *Terenura callinota* Scl.—Ropaybamba (Jelski).
42. *Myrmeciza hemimelena* Scl.—Amable-Maria (Jelski).
43. *Pithys albifrons peruviana* Tacz.—Amable-Maria (Jelski).



44. *Talaphorus hypostictus* (Gld.).—Soriano (Jelski).
45. *Tolema schreibersi* (Bourc.).—C. Pérou (Jelski).
46. *Aglaeactis castelnaudi* Bourc. et Muls.—Junin, Acancocha (Jelski).
47. *Rhamphomicron microrhynchum* (Boiss.). — Auquimarca (Jelski).
48. *Schistes geoffroyi* (Bourc. et Muls.).—Paltaypampa, Huanta (Jelski).
49. *Leucippus pallidus* Tacz.—Huanta (Jelski), coll. Raimondi.
50. *Stenopsis "aequicaudata."*—Pumamarca (Jelski).
51. *Hydropsalis lyra* Bp.
52. *Steatornis caripensis peruviana* Tacz.—Pumamarca (Jelski).
53. *Cypselus montivagus* d'Orb.—Huanta, Pumamarca (Jelski).
- +54. *Campephilus haematogaster* (Tsch.).—Chilpes (Jelski).
55. *Nonnula ruficapilla* (Tsch.).—Amable-Maria (Jelski).
56. *Micrastur gilvicollis* (Vieill.).—Amable-Maria (Jelski).
- +57. *Ara militaris* (L.).—Amable-Maria (Jelski).
- +58. *Harpyhaliaëtus coronatus* (Vieill.).—Chanchamayo (Tschudi), Amable-Maria (Jelski).
- +59. *Falco cassini* Sharpe.—Junin (Jelski).
60. *Columba "vinacea* (Temm.)."—Amable-Maria (Jelski).
61. *Zenaida maculata* (Vieill.).—Auquimarca (Jelski).
62. *Tinamotis pentlandi* Vig.—Ninarupa (Jelski).
- +63. *Mycteria americana* L.—Montaña de Vitoc (Tschudi).
64. "*Nycticorax gardeni* (Gml.)."—Environs de Junin (Jelski).
65. *Phegornis mitchelli* Gray.—Lac Junin (Jelski).
66. *Attagus gayi* Geoffr. et Less.—Ninarupa (Jelski).

Ainsi le nombre des espèces connues de cette région est de 483 + 66 = 549.

Ci-dessous nous donnons la liste des espèces trouvées par feu Jelski à Monterico. Cette localité est située dans la vallée de Choymacota (départ. de Ayacucho), c'est-à-dire un peu plus au sud que la région qui nous occupe. Il est à supposer que la plupart de ces espèces se retrouveront dans les districts de Chanchamayo et de Vitoc.

- |  |  |
|--|--|
| 1. <i>Cyphorhinus thoracicus</i> Tsch.         | 20. <i>Herpsilochmus rufimarginatus</i>        |
| +2. <i>Vireo flavoviridis</i> (Cass.).         | (Temm.).                                       |
| 3. <i>Myiophilus flaviventris</i> Cab.         | 21. <i>Myrmotherula cinereiventris</i> ScL. et |
| 4. <i>Vireolanius chlorogaster</i> Bp.         | Salv.  |
| 5. <i>Phoenicotheraps peruvianus</i> Tacz.     | 22. <i>Hypocnemis myiotherina</i> (Spix).      |
| 6. <i>Lanio versicolor</i> (Laf.).             | 23. " theresæ (Des Murs).                      |
| +7. <i>Pitylus grossus</i> (L.).               | 24. <i>Campephilus tracheolopyrus</i> Malh.    |
| 8. <i>Euscarthmus ruficularis</i> Cab.         | 25. <i>Galbula chalcothorax</i> ScL.           |
| 9. <i>Phyllomyias cinereicapilla</i> Cab.      | 26. <i>Malacoptila fusca</i> (Gml.).           |
| +10. <i>Myiodynastes luteiventris</i> (Less.). | 27. <i>Capito auratus</i> (Dum.).              |
| 11. <i>Myiobius phœnicurus</i> ScL.            | 28. " aurantiicollis ScL.                      |
| 12. <i>Empidochanes olivus</i> (Bodd.).        | 29. <i>Rhamphastus cuvieri</i> Wagl.           |
| +13. <i>Contopus plebejus</i> Cab.             | 30. <i>Mitua mitu</i> (L.).                    |
| +14. <i>Hadrostromus audax</i> Cab.            | 31. <i>Pipile cumanensis</i> (Jacq.).          |
| 15. <i>Lipaugus simplex</i> (Licht.).          | 32. <i>Tinamus ruficeps</i> ScL. et Salv.      |
| 16. <i>Lochmias obscurata</i> (Cab.).          | 33. <i>Odontophorus pachyrhynchus</i> Tsch.    |
| 17. <i>Sclerurus olivaceus</i> Cab.            | 34. <i>Conurus lucyani</i> Dev.                |
| 18. <i>Automolus subulatus</i> (Spix).         | 35. <i>Chrysotis farinosa</i> Bodd.            |
| +19. <i>Cymbilanius lineatus</i> (Leach).      |  |

Les espèces suivantes paraissent propres à la région  
du Chanchamayo.

- |   |   |
|---|---|
| 1. <i>Turdus phæopygus spodiolaemus.</i>                      | 47. <i>Siptornis humilis.</i>                                 |
| 2. <i>Entomolestes leucotis.</i>                              | 48. „ <i>taczanowski.</i>                                     |
| 3. <i>Cinnicerthia peruana.</i>                               | 49. „ <i>graminicola.</i>                                     |
| 4. <i>Thryothorus cantator.</i>                               | 50. „ <i>virgata.</i>   |
| 5. <i>Troglodytes solstitialis macrourus.</i>                 | 51. „ <i>albicapilla.</i>                                     |
| 6. <i>Basileuterus uropygialis poliothrix.</i>                | 52. <i>Sclerurus olivascens.</i>                              |
| 7. <i>Hylophilus flaviventris.</i>                            | 53. <i>Thripadectes scrutator.</i>                            |
| 8. <i>Diglossa pectoralis.</i>                                | 54. <i>Philydor montanus.</i>                                 |
| 9. <i>Chlorochrysa calliparaea.</i>                           | 55. <i>Anabazenops rufosuperciliatus</i><br><i>cabanisi.</i>  |
| 10. <i>Iridornis jelskii.</i>                                 | 56. <i>Xiphocolaptes phæopygus.</i>                           |
| 11. „ <i>reinhardti.</i>                                      | 57. <i>Thamnophilus melanurus debilis.</i>                    |
| 12. <i>Poecilothraupis lacrymosa.</i>                         | 58. „ <i>variegaticeps.</i>                                   |
| 13. „ <i>igniventris igni-</i><br><i>crissa.</i>              | 59. <i>Dysithamnus dubius.</i>                                |
| 14. <i>Buthraupis cucullata cyanonota.</i>                    | 60. <i>Myrmotherula sororia.</i>                              |
| 15. <i>Dubusia stictocephala.</i>                             | 61. <i>Herpsilochmus motacilloides.</i>                       |
| 16. <i>Chlorospingus auricularis.</i>                         | 62. <i>Myrmeciza spodiogastra.</i>                            |
| 17. „ <i>chrysogaster.</i>                                    | 63. <i>Chamaeza olivacea.</i>                                 |
| 18. „ <i>cinereocephalus.</i>                                 | 64. <i>Conopophaga castaneiceps brunnei-</i><br><i>nucha.</i> |
| 19. „ <i>berlepschi.</i>                                      | 65. <i>Scytalopus femoralis.</i>                              |
| 20. <i>Nemosia pectoralis.</i>                                | 66. „ <i>acutirostris.</i>                                    |
| 21. <i>Pipilopsis tricolor.</i>                               | 67. <i>Eutoxeres condamnei gracilis.</i>                      |
| 22. „ <i>mystacalis.</i>                                      | 68. <i>Phaethornis rufigaster longipennis.</i>                |
| 23. <i>Buarremon poliophrys.</i>                              | 69. <i>Lafresnayeia saul rectirostris.</i>                    |
| 24. <i>Catamblyrhynchus diadema citrini-</i><br><i>frons.</i> | 70. <i>Spathura annæ.</i>                                     |
| 25. <i>Pseudochloris sharpei.</i>                             | 71. <i>Lamproaster branickii.</i>                             |
| 26. <i>Spinus ictericus peruanus.</i>                         | 72. <i>Metallura eupogon.</i>                                 |
| 27. <i>Xanthoura jolyæa.</i>                                  | 73. „ <i>opaca jelskii.</i>                                   |
| 28. <i>Ochthodonta signata.</i>                               | 74. <i>Eriocnemis sapphiropygia.</i>                          |
| 29. <i>Euscarthmus rufigularis.</i>                           | 75. <i>Oreotrochilus melanogaster.</i>                        |
| 30. <i>Orchilus albiventris.</i>                              | 76. <i>Lampropygia columbiana obscura.</i>                    |
| 31. <i>Cyanotis rubrigastra alticola.</i>                     | 77. <i>Lencippus pallidus.</i>                                |
| 32. <i>Leptopogon rufipectus.</i>                             | 78. <i>Macropsalis kalinowskii.</i>                           |
| 33. <i>Capsiempis orbitalis.</i>                              | 79. <i>Chloronerpes chrysogaster.</i>                         |
| 34. <i>Phyllomyias cinereocapilla.</i>                        | 80. <i>Dendrobates malherbei pectoralis.</i>                  |
| 35. <i>Tyranniscus frontalis.</i>                             | 81. „ <i>valdizani.</i>                                       |
| 36. „ <i>viridiflavus.</i>                                    | 82. <i>Picumnus jelskii.</i>                                  |
| 37. <i>Chloropipo unicolor.</i>                               | 83. „ <i>punctifrons.</i>                                     |
| 38. <i>Pipra comata.</i>                                      | 84. <i>Malacoptila fulvularis melano-</i><br><i>pogon.</i>    |
| 39. <i>Hadrostomus audax.</i>                                 | 85. <i>Capito glaucogularis.</i>                              |
| 40. <i>Pipreola viridis intermedia.</i>                       | 86. <i>Leptosittaca branickii.</i>                            |
| 41. „ <i>elegans.</i>   | 87. <i>Pyrhura rupicola.</i>                                  |
| 42. <i>Doliornis sclateri.</i>                                | 88. <i>Nothoprocta branickii.</i>                             |
| 43. <i>Geositta saxicolina.</i>                               | 89. „ <i>taczanowskii.</i>                                    |
| 44. <i>Upucerthia pallida.</i>                                | 90. <i>Rallus nigricans humilis.</i>                          |
| 45. „ <i>serrana.</i>   |   |
| 46. <i>Schizæaca palpebralis.</i>                             |   |

Quant aux relations de la faune ornithologique de cette région comparée avec celles des contrées voisines, nous réservons nos remarques pour une époque future, quand ces faunes seront mieux connues qu'elles ne le sont à présent.

4. Note on the Presence of an extra Pair of Molar Teeth in a *Lemur fulvus*. By G. ELLIOT SMITH, M.D., Professor of Anatomy, Egyptian Government Medical School, Cairo<sup>1</sup>.

[Received April 3, 1902.]

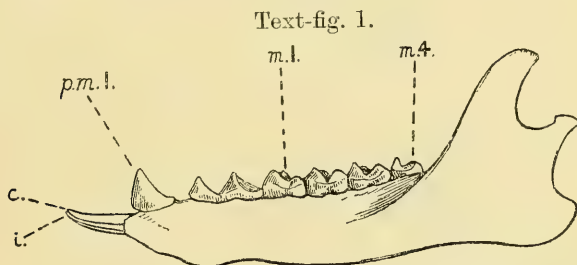
(Text-figure 1.)

Among a number of Lemurs which Captain Stanley Flower, Director of the Ghizeh Zoological Gardens, has kindly placed at my disposal during the past year was a male *Lemur fulvus* with four molar teeth in each half of the mandible (text-fig. 1).

Dr. Forsyth Major, whom I consulted on this matter as our greatest authority on Prosimian anatomy, deems this anomalous condition worthy of being placed on record.

The individual in which these additional teeth were found had attained to the full adult proportions, but the cranial sutures were still distinct.

The teeth of the maxilla were normal in number, size, and shape. All of the teeth usually found in the mandible of this species of Lemur were also present in this specimen, and none of them deviated in any respect from the condition normal to the species. But there was present behind each third lower molar a tooth of



Left lateral aspect of the anomalous mandible of *Lemur fulvus*. ♂, nat. size.

approximately the same form and four-fifths of its dimensions. The only difference in shape, which a careful comparison of the third and fourth molars revealed, was due to the diminutive proportions of the postero-external cusp of the latter.

According to Tomes, some of the extinct species of Lemurs have "the full mammalian number of four premolars, and so were . . . less specialized than their recent descendants."<sup>2</sup>

The anomalous case now described is, in a sense, compensatory to the last-quoted, for it possesses four molars and only three premolars.

The tendency to the persistence of the primitive number of four molars is seen in its most pronounced form in the Order

<sup>1</sup> Communicated by Prof. G. B. HOWES, F.R.S., F.Z.S.

<sup>2</sup> C. S. Tomes, 'Dental Anatomy,' 5th ed., 1898, p. 501.

Marsupialia. Among the Carnivora, *Otocyon* also retains the four molars, which Huxley considered the primitive equipment of grinders in the Canidæ<sup>1</sup>; and for the Insectivora Oldfield Thomas has recorded the existence of a fourth upper molar in *Centetes*<sup>2</sup>.

The occurrence of a fourth lower molar in a recent Lemur seemed to suggest the possibility of an archaic four-molared ancestor of the Primates; but Dr. Forsyth Major informs me that, in his opinion, in the Eutheria a fourth molar is *always* secondary.

5. On some Nudibranchs from Zanzibar. By Sir CHARLES ELIOT, K.C.M.G., Commissioner and Consul-General in the British East-African Protectorate.

[Received April 1, 1902.]

(Plates V. & VI.<sup>3</sup> and Text-figures 2-5.)

During the last year Mr. Crossland has been most kindly investigating for me the fauna of the eastern and western coasts of Zanzibar. He has not only collected a large number of Opisthobranchs, but also greatly increased the value of his collection by drawings of the living animals. The present paper contains some of the results of his labours in the shape of notes on three apparently new genera of Nudibranchs—*Zatteria*, *Dunga* (Æolididæ), and *Crosslandia* (Scyllæidæ), and on two interesting species on which little seems to have been written since the time of Alder and Hancock—*Melibe fimbriata* and *Madrella ferruginosa*. The Æolididæ are already divided into forty or fifty genera, and it is with reluctance that I add to their number, believing that it would more properly be reduced. But as long as the definitions of the existing genera are so minute and narrow, they cannot be made to accommodate fresh forms, for which new, though probably only provisional, genera must be created.

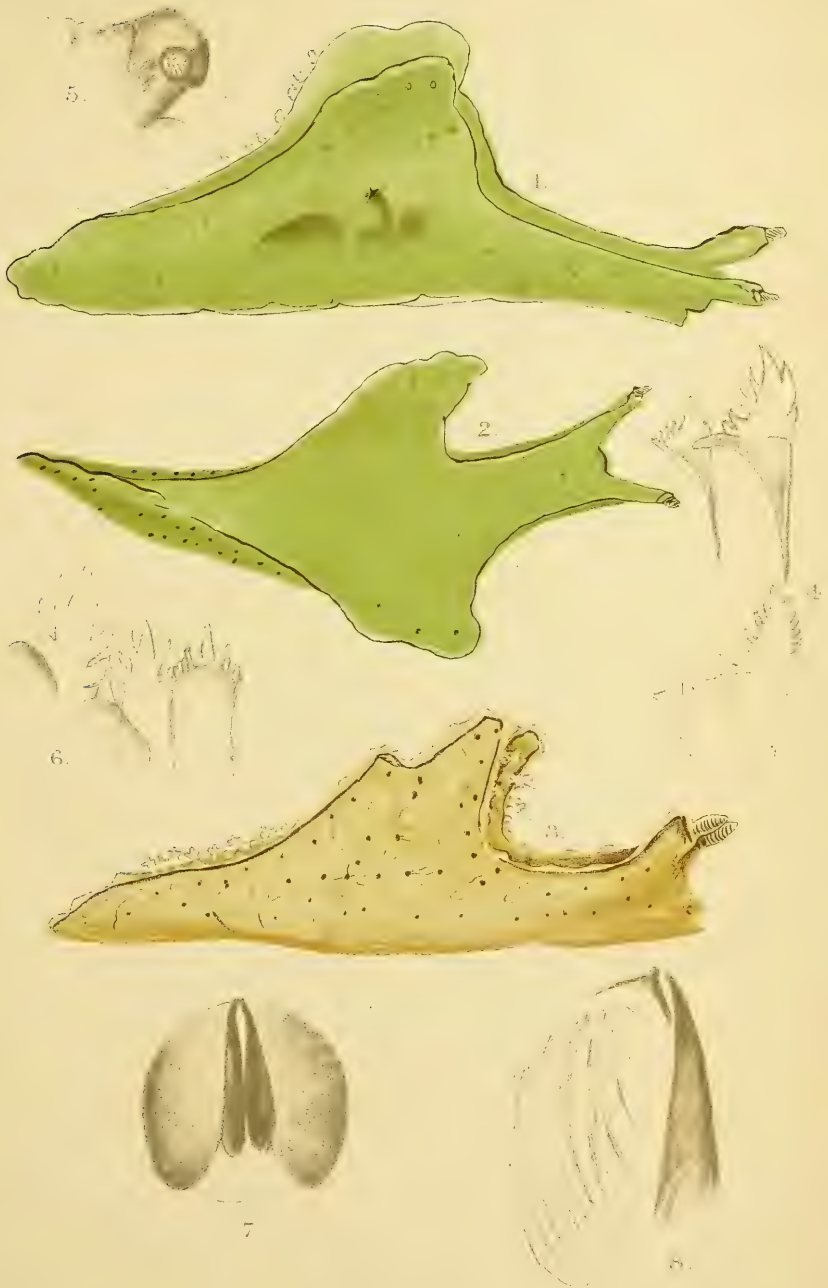
*ZATTERIA* BROWNI, gen. et sp. nov. (Plate VI. figs. 9-13.)

Three specimens were found in seaweed collected on the reefs round Prison Island, in Zanzibar Harbour, in May 1901. The largest was .8 cm. long by .2 cm. broad. The body is long and narrow, and terminates in a peculiarly slender tail, which is nearly a quarter of the length of the whole animal. The cerata are arranged in eight transverse rows (Pl. VI. fig. 10), each row containing eight cerata, four on each side. The first two rows and the last four are crowded together, but the two series in the middle are separated one from another and from the anterior and posterior clumps by considerable intervals. The most distinctive character of the genus is the shape of the cerata (Pl. VI. fig. 11), which are not even but swell out into two or three projecting rings, the first

<sup>1</sup> P. Z. S. 1880, p. 284.

<sup>2</sup> P. Z. S. 1892, p. 503.

<sup>3</sup> For explanation of the Plates, see p. 72.



Eale & Danielsson Ltd lith.









a little below the tip. Above the mouth are two short, slender, erect tentacles. Behind them are the rhinophores, which are considerably longer and more slender than the cerata: they bear about eight bracket-like semicircles, which alternate with one another, so that there is not a complete circle round the rhinophore; at the base of each rhinophore is a black eye-spot. The foot is rounded in front and the corners are not produced in tentacle-like expansions (Pl. VI. fig. 13).

The body is translucent and colourless (the viscera being white) with a few blotches formed of opaque white dots. The cerata are also translucent, except at the rings, which are opaque white; they bear a few orange spots or streaks. There is a long orange streak on each rhinophore.

The jaws are small and the masticatory edge is finely denticulate. The radula is short and uniseriate. Each tooth is shaped like a horse-shoe and bears on its anterior margin one large denticle with six small ones on each side (Pl. VI. fig. 12). No trace of armature was discoverable in the reproductive organs.

In many characters, in the disposition of the cerata, the rounded anterior margin of the foot, and the buccal parts, the animal appears allied to *Cratena*; but it differs in two points, the rudimentary perfoliation of the rhinophores and the rings round the cerata. The latter peculiarity is, so far as I am aware, unrecorded among the *Æolids*, but it almost entirely disappears in specimens preserved in alcohol, and it is therefore possible that it may really exist in other genera which have been described from such specimens.

DUNGA NODULOSA, gen. et sp. nov.

This animal is fairly common on colonies of *Sertularia*. The body and tail are both long. The cerata are easily detached and have then some power of independent movement. They are carried very erect in the living animal and are set in transverse rows varying from four to six in number. Behind the last transverse row is a clump of smaller cerata, also of varying number. Probably the caducous character of the appendages has something to do with these variations. Each transverse row consists of ten cerata, gradually increasing in size from the outside to the centre, the two middle ones being much larger than the others. The outer cerata are of the ordinary cylindrical shape; the middle ones are swollen and ovate, but terminate in a fine point. At the top of the broad part and at the base of this point are eight knobs. The rhinophores are very long and simple. The tentacles are moderately long, and the anterior angles of the foot are produced into processes of about the same length. The foot is narrow and without markings. The length varies from .5 to 1.2 cm.

The coloration is very variable and ranges from clear light yellow to purplish brown. These differences may be partly due to two different colours of the liver diverticula seen in the

transparent cerata. But in all cases the tips of the cerata are pink and the knobs of a brilliant white, with a white streak extending upwards and sometimes with white spots below. The back, cerata, rhinophores, and tentacles are covered with small spots of the same colour as the body but darker. The rhinophores have usually, but not always, dark circular bands. The intestines, which are clearly visible, are light or dark yellow.

The jaws are of moderate size; the masticatory edge is bluntly denticulate, but on the lower part only. The radula consists of a single row of teeth. The central part of each tooth is prolonged into a short bluntish point; on either side are three denticulations. I could discover no armature in the reproductive system.

The general characters and inflated cerata of this genus resemble the *Tergipedinae*, and the figures of *Capellinia capellinii* (by Trinchese) and those of *Tergipes* (*Capellinia*) *dorice* (by Vayssière) represent the cerata of these species as nodulous. But the *Tergipedinae* have the foot rounded anteriorly, and the arrangement of the cerata in this animal is peculiar; it therefore seems necessary to create a new genus for it.

CROSSLANDIA VIRIDIS, gen. et sp. nov. (Plate V. figs. 1-8).

In July and September, 1901, were captured at Zanzibar four specimens of a nudibranch closely allied to *Scyllaea*, though strikingly different in external appearance. The four specimens seem to constitute a new genus and possibly two species, though one may prove to be merely a well-marked variety. The animal in question may possibly be a *Nerea*, Lesson. I have not access to the original authorities, but Fischer's 'Manuel de Conchyliologie,' p. 536, says: "Le genre *Nerea*, Lesson, 1830, a été placé dans le voisinage des *Scyllaea*. Rhinophores courts, coniques, ciliés, visibles au dessus d'un petit voile frontal: tête courte, tronquée en avant; corps fournissant de chaque côté deux lobes; branchies disposées en petites touffes sur les lobes latéraux et sur la queue." From this description and from the fact that Bergh, in his 'System der Nudibranchiaten Gasteropoden,' takes no notice of *Nerea*, it may be presumed that the characters are not sufficiently defined to constitute a valid genus.

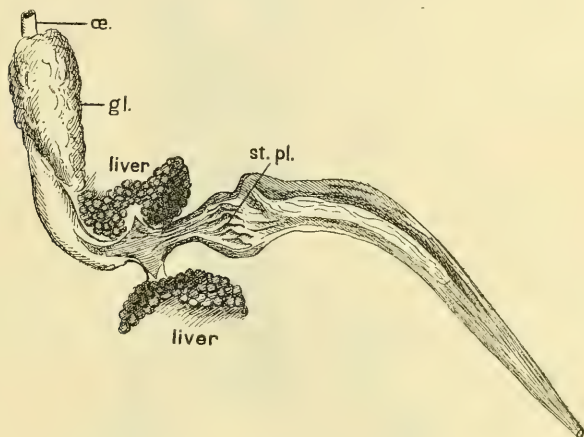
The length of a large specimen is nearly 5 centimetres, and the general appearance superficially resembles *Elysia* and in no way recalls *Scyllaea*, which, however, I have never seen alive, although I have examined numerous alcoholic specimens. The body is fairly long; it is produced into a neck and tail and laterally into two wing-like lobes, one on each side, which are more or less distinctly bifid, but in no specimen can be compared to the two pair of cerata found in *Scyllaea*, and are not constricted at the base. The animal when crawling generally directs them laterally. The colour is vivid green, harmonizing exactly with the young leaves of *Zostera* on which the animal was found. At the side of the body below the lobes is a row of irregular projecting sandy



markings. Round the edges of the lobes, the angles of the body, the ridge of the tail, the cups of the rhinophores, and the frontal veil runs a brown line. The surface of the body is covered with microscopic brown specks, which here and there are aggregated into spots just visible to the naked eye. There are also a few other spots.

There are no anterior tentacles, but a small frontal velum. The rhinophores are perfoliate and set in little open cups on the top of fairly long pillars, which are usually held nearly horizontally and have not any process behind as in *Scyllæa* (see Pl. V. fig. 5). The back and inside of the wings are covered with colourless, transparent contractile branchiæ similar to those of *Scyllæa* (text-fig. 3, p. 66). On the tail is a slight ridge, not amounting to a crest. The foot is very narrow.

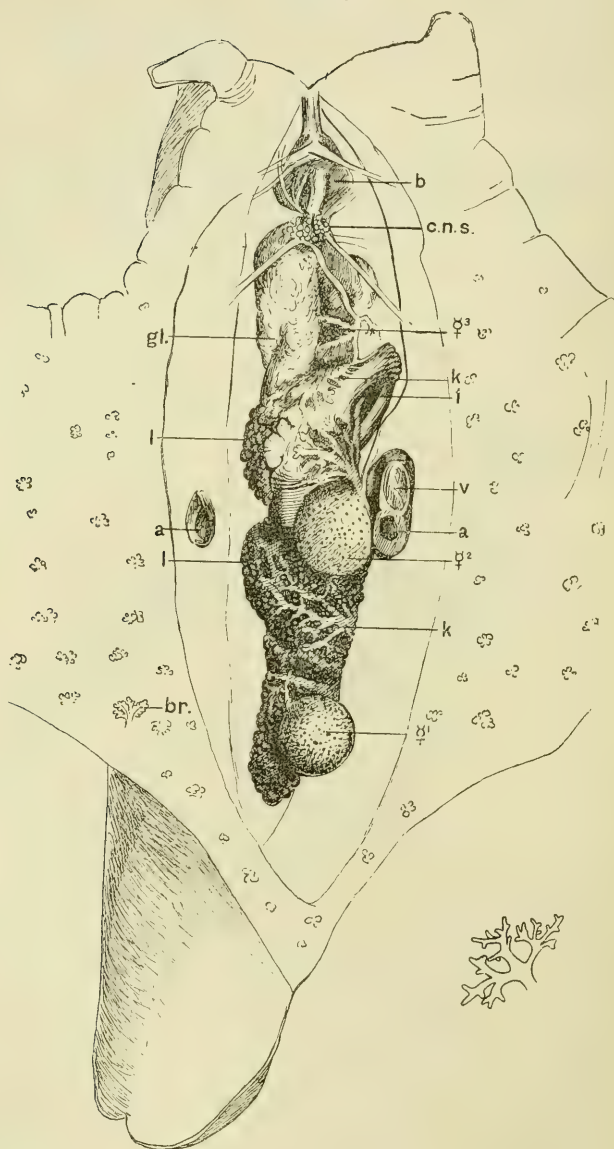
Text-fig. 2.

Digestive organs of *Crosslandia viridis*.

œ., œsophagus. | gl., gland. | st. pl., stomach-plates.

The body-cavity is spacious anteriorly until the commencement of the liver. After this point it is quite narrow, owing to the thickness of the soft transparent body-wall. The jaws (Pl. V. figs. 7, 8) are large and hinged dorsally. The masticatory edge is smooth and flexible, of a deep brown colour and bent outwards, the muscles being attached at the bend and covering the large stiff cheeks. The radula (Pl. V. figs. 4, 6) is short; each row consists of a median tooth and about 30 laterals on each side. The median tooth has a fairly large spine in the centre of the anterior margin and about 5 denticulations on each side, of which the pair nearest the centre are considerably larger than the others. The lateral teeth are also denticulate, but vary somewhat in form, and the corresponding teeth in the different rows do not always

Text-fig. 3.



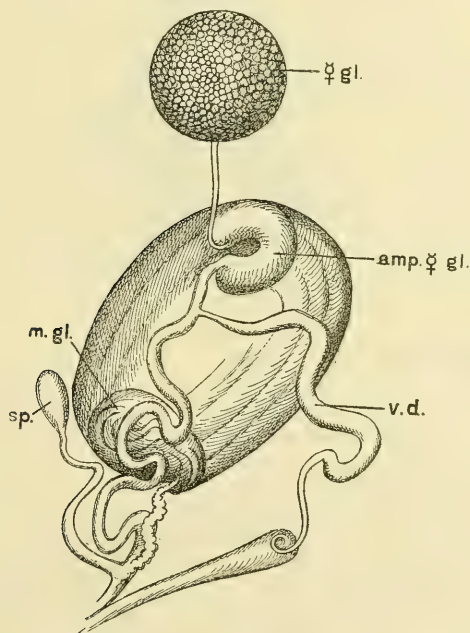
General view of the intestines of *Crosslandia viridis*.—The body has been opened by a cut made somewhat to the right and dividing the heart in two.

<i>a.</i> , auricle.	♂¹, ♀², ♀³, three hermaphrodite glands.	<i>k.</i> , kidney.
<i>b.</i> , buccal mass.	<i>gl.</i> , gland on oesophagus.	<i>l.</i> , liver.
<i>br.</i> , branchial tuft.	<i>i.</i> , intestine.	<i>v.</i> , ventricle.
<i>c.n.s.</i> , central nervous system.		

One branchial tuft enlarged is shown separately.

agree in shape. Those nearest the rhachis are generally denticulate on both sides: the ordinary teeth are denticulate only on the external side: those towards the end of the row are again denticulate on both sides but of a peculiar form; the outermost are degraded. On the œsophagus lies a large gland of apparently salivary functions. The œsophagus, which is narrow, broadens at this gland, and the digestive tract continues of much the same length until near its termination. On slitting it open (text-fig. 2, p. 65) the traces of a stomach are found, and an internal constriction is caused by the presence of a ring of large horny teeth. Just beyond this point is a large typhlosole with an irregularly laminated interior surface. The anus is lateral, beneath the right wing. The liver is in two compact masses, anterior and posterior; they send forth very slender light green diverticula, which until carefully examined have rather the appearance of veins, to the base of the wings and rhinophores.

Text-fig. 4.

Hermaphrodite gland of *Crosslandia viridis*.

*amp. ♀ gl.*, ampulla of hermaphrodite gland.  
*♀ gl.*, one of the three portions of the  
 hermaphrodite gland.

*m. gl.*, mucous gland.  
*sp.*, spermatheca.  
*v.d.*, vas deferens.

The ganglia in the central nervous system are distinct, the pedal being ventral to the œsophagus.

The pericardium (text-fig. 3, p. 66) is embedded in the body-wall: its pulsations are visible externally.

The kidney (text-fig. 3) is spread over the liver, and also on its ventral surface, as a number of distinct branching tubes, which continue in front of the liver, lying loosely in the body-cavity.

The hermaphrodite gland (text-fig. 4, p. 67) consists of three granular, spherical bodies, somewhat on the right side of the liver, one at each end and one in the middle, but not fused with it or embedded in it. The ampulla is large. There is only one spermatotheca. Prostates are absent, and the penis is small and unarmed.

It will thus be seen that in its internal structure this animal closely resembles *Scyllæa*. The only important difference is that the hepatic diverticula are very small and extend only to the bases of the wings, whereas in *Scyllæa* (? in all species) they are said to penetrate to the ends of the cerata and into the branchial tufts. I have wondered whether the creature could be a young *Scyllæa* in which the bifid lobes would subsequently divide into two pairs of cerata, but the size, which is as large as that of most *Scyllææ*, renders this improbable. Taken in conjunction with the character of the liver, the external differences (the wings instead of two pairs of cerata, the absence of a caudal crest and of flaps behind the rhinophores) seem sufficiently great to warrant the creation of a new genus, which I have named *Crosslandia* after Mr. Crossland, who dredged the first specimen.

One of the specimens (Pl. V. fig. 3) showed marked peculiarities, and is certainly a well-defined variety if not of a distinct species. The body was stouter and the outline more wrinkled and indented. The colour was that of *Fucus*, with a few pointed sandy projections and coralline purple spots. If it proves to be a distinct species I would call it *C. fusca*.

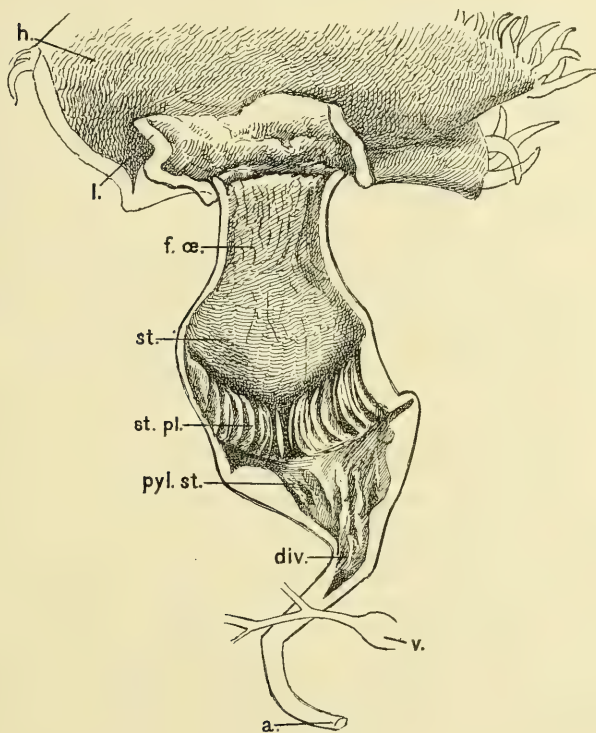
MELIBE FIMBRIATA Ald. & Hanc. Trans. Zool. Soc. vol. iii. pp. 137-139 (1864).

A large number of specimens of this remarkable animal were captured on both the east and west sides of Zanzibar in 1901. Alder and Hancock's figure and description give a good idea of its external appearance; but the coloration is very variable, ranging from clear bright yellow to ashy grey. Sometimes the colour is uniform, but more often the surface of the body and of the papillæ is marked with irregularly disposed spots and blotches, which may be black, white, grey, or sandy. These markings harmonize with the ordinary environment of the creature, and cause it to closely resemble a piece of seaweed besprinkled with sand and partially encrusted with sponges and other animal growths. In full-grown and perfect specimens, which are six inches long or more, the number of papillæ seems to be six or seven on each side of the body; but they are very easily detached, and few individuals have the two series complete.

I also found Alder and Hancock's description of the internal

anatomy to be correct, particularly as regards the absence of jaws. They say: "In *Melibe* the buccal organ is provided with neither tongue, jaws, nor collar." Bergh, in his monograph on the genus (in *Malac. Untersuch. in Semper's Reisen*, Th. ii. Bd. i. p. 363), thinks this statement will probably prove incorrect as other species of *Melibe* are provided with jaws, and he gives as a generic character: "Bulbus pharyngeus cum mandibulis aliquantulum ut in *Phylliroidis*: margo masticatorius mandibulæ fortiter dentatus."

Text-fig. 5.

*Melibe fimbriata.*

a., anus.  
div., diverticulum.  
f.œ., folds of œsophagus.  
h., hood.  
l., lip.

pyl.st., pyloric portion of stomach.  
st., thin-walled stomach.  
st.pl., belt of stomach-plates.  
v., ventricle of heart.

Mr. Crossland and I have, however, dissected several specimens of *Melibe fimbriata*, and in all failed to detect any trace of jaws. Our drawing (text-fig. 5) will perhaps explain clearly the structure of the digestive tract. In the centre and bottom of the hood is a protruding, circular, fleshy lip. This leads straight into the



œsophagus, which is provided with a series of folds, but no hard armature of any kind. The stomach is set with a belt of horny plates of two sizes and usually alternating regularly, the small being next to the large. The pyloric portion of the stomach below this belt is provided with muscular ridges, and passes almost imperceptibly into the intestine. At the point where it begins to be constricted is a pouch-like diverticulum with a laminated interior.

With the exception of the absence of jaws, the other characters of this animal clearly connect it with *Melibe*, not *Tethys*. The foot is very narrow, the body rather high and compressed; the cerata are covered with knots; the buccal opening passes straight into the œsophagus; the stomach is armed with plates; the liver is long and follicular and does not extend far into the cerata; the hermaphrodite gland is composed of many separate lobes at the side and under the liver. In *Tethys*, on the contrary, the foot is broad and the body flat; the cerata are smooth; there is a division of the alimentary canal before the œsophagus which may be called a buccal cavity; the liver is a compact mass sending diverticula to the ends of the cerata; the hermaphrodite gland forms a thick covering over the liver. Further, *Tethys* is described as possessing true branchiæ set at the base of the cerata. The back of *Melibe fimbriata* is covered with branched papillæ which bear a superficial resemblance to gills, but I could not discover that they have any special connection with the vascular system, and they seem analogous to the ramose appendages of *Plocamophorus* and some species of *Notarchus*.

It would thus appear that *Melibe fimbriata* is intermediate between *Tethys* and the jaw-bearing species of *Melibe*. It does not, however, seem necessary to create a new genus, but rather to modify the existing description of the genus and say *jaws present or absent*. The shape of the foot, body, and cerata, the presence of stomach-plates, the absence of branchiæ, and the character of the liver distinguish it sufficiently from *Tethys*.

In spite of its want of jaws, *Melibe fimbriata* is a most voracious animal, and I more than once found in the stomachs which I examined limbs of crustacea more than an inch long. The way in which it captures its prey is extremely curious. The circular oral veil acts as a net with an elastic rim. When seeking for food it expands the net and sweeps with it the surface over which it is crawling. The skin of the hood is stretched so tight as to be quite transparent and the marginal cirri are almost invisible. The moment a small crustacean or other prey is caught the net closes up, the cirri almost unite on the under surface, and the skin ceases to be perfectly transparent. Then the *Melibe* tosses the hood, which has now practically become a closed sac, backwards, and creates a current of water with the cirri, which forces its prey towards its mouth. The movements of the animal are rapid and energetic, whether it crawls or swims. It can also float on the surface foot uppermost.

MADRELLA FERRUGINOSA. (Plate VI. figs. 14-16.)

*Madrella ferruginea* Ald. & Hanc. Trans. Zool. Soc. iii. pp. 141-2 (1864).

No fresh details have, I believe, been published respecting this genus since Alder and Hancock's description. I have seen two specimens at Zanzibar, one about half an inch long and the other nearly double the size. The colour of the body is a deep coppery red. Round the edge of the mantle, including the anterior margin, are transparent copper-coloured cerata, into each of which passes a very short diverticulum of the liver. The black or deep purple ramifications of the liver are visible through the dorsal integuments. There are many more cerata in the large than in the smaller specimen, and it is therefore possible that they increase with age. The middle of the dorsal area is bare, except that it carries several irregularly distributed tubercles or papillæ. In the large specimen they pass between the rhinophores and form a sort of rudimentary crest, but in the smaller specimen, though they occur on the back, they do not pass between the rhinophores. The large specimen had a white blotch between the rhinophores, the smaller none. The form of the rhinophores is somewhat unusual. They are not perfoliate, but there is a circle of papillæ round the top of the club, somewhat as in *Tritonia*. There are no anterior tentacles, but the head is very broad and crescent-shaped, with produced ends. The front of the foot is wide and square, but the corners are not prominent. The mouth is ventral. Both the mantle-edge and the foot are wide, but between them is a deep groove. In crawling the foot projects beyond the mantle. The mantle overhangs the head and forms a wide frontal veil. The genital orifices are in the anterior part of the right-hand side, the anus in the posterior part, distinctly lateral and not dorsal.

The internal anatomy, so far as I could examine it, agreed with the description of Alder and Hancock. I was unable to see any salivary glands. The jaws are very large, enclosing the buccal mass, but not denticulate. The radula (Pl. VI. fig. 16) is triseriate and long. The median tooth has a strong blunt spine in the centre and about 7 denticulations on each side. The laterals have a large spine on the outer margin and 8 or 9 denticulations on the inner side. These denticulations seem therefore somewhat less numerous than those described by A. & H. The ganglia in the central nervous system are very distinct. *Madrella* appears to be sluggish in its movements. In confinement it discharged some fluid, which imparted a ferruginous colour to the water round it. This discharge did not appear to proceed from any particular organ, but from the whole surface of the body.

The genus forms an interesting connecting link between the Janidæ and other Æolidæ. The arrangement of the liver and cerata connect it decisively with the former, but in its lateral anus and triseriate radula it approaches the general characters of the group and departs from the exceptional peculiarities of the Janidæ,

which have a dorsal anus and a multiseriate radula. As a family the Janidae are characterized by the presence of hepatic diverticula and of cerata in the anterior portion of the dorsal surface, in front of the rhinophores. Another character peculiar to the family, but not universal in it, is the crest between the rhinophores. There are four well-marked genera:—*Madrella*, with lateral anus, triseriate radula, papillous rhinophores, a rudimentary crest, and jaws without teeth. The other three genera have the additional peculiarities of a dorsal anus and a multiseriate radula. *Proctonotus* has simple rhinophores, no crest, and jaws without denticles. *Janolus* has perfoliate mandibles and very large jaws without denticles; the foot is also exceptionally broad. *Janus* has perfoliate rhinophores, a toothed mandible, and a crest.

## EXPLANATION OF THE PLATES.

## PLATE V.

Figs. 1, 2. *Crosslandia viridis*, p. 64.

- |    |   |   |  |
|----|---|---|--|
| 3. | " | " | var. (?) <i>fusca</i> .                            |
| 4. | " | " | outer teeth of two consecutive rows of the radula. |
| 5. | " | " | rhinophore cup, one side removed.                  |
| 6. | " | " | central and inner teeth of radula.                 |
| 7. | " | " | jaws, from in front.                               |
| 8. | " | " | jaws, from the side.                               |

## PLATE VI.

Fig. 9. *Zatteria browni*, p. 62.

- |         |                                      |   |  |
|---------|--------------------------------------|---|--|
| 10.     | "                                    | " | diagrammatic view showing position of cerata.                              |
| 11.     | "                                    | " | one of the cerata.   |
| 12.     | "                                    | " | tooth of radula.   |
| 13.     | "                                    | " | view of head from below.   |
| 14, 15. | <i>Madrella ferruginosa</i> , p. 71; |   | dorsal and ventral view.   |
| 16.     | "                                    | " | one row of radula— <i>a</i> , median; <i>b</i> , <i>b</i> , lateral teeth. |

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June 3, 1902.

Dr. HENRY WOODWARD, F.R.S., Vice-President, in the Chair.

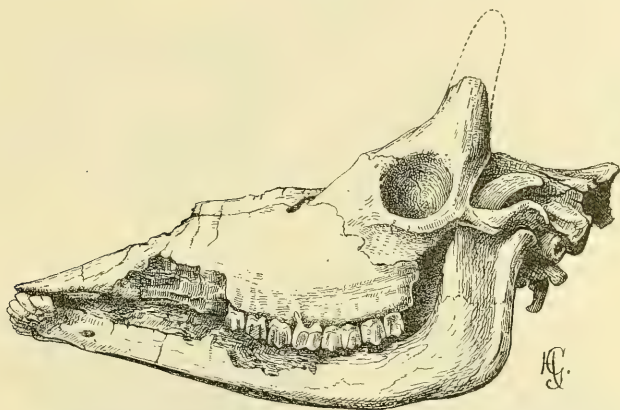
Mr. W. L. Slater, F.Z.S., made some remarks on the present condition and future prospects of the Zoological Museums of South Africa, most of which he had recently visited. These were altogether eight in number, four of which were in the Cape Colony—namely, the South African Museum at Cape Town, the Albany Museum at Grahamstown, the King-William's-Town Museum, and the Port Elizabeth Museum. In Natal there were Museums at Durban and Pietermaritzburg, in the Transvaal the Museum at Pretoria, and in the Orange River Colony the National Museum at Bloemfontein.

Mr. Boulenger exhibited a strap made of Okapi skin, which had been received, along with other ethnographical curiosities, at the Abbey of Maredsous, in Belgium, in December 1899, thus some time previous to the arrival in this country of the piece of skin on which "*Equus johnstoni*" (P. Z. S. 1901, vol. i. p. 50) had been founded. This object had been obtained by M. E. Vincart, a lieutenant in the service of the Congo State, in the Mangbettu

country (lat.  $3^{\circ}$  N., long.  $28^{\circ}$  E.), where, according to his statement, chiefs alone have the privilege of wearing straps or belts made of the skin of what he had regarded as a rare Antelope.

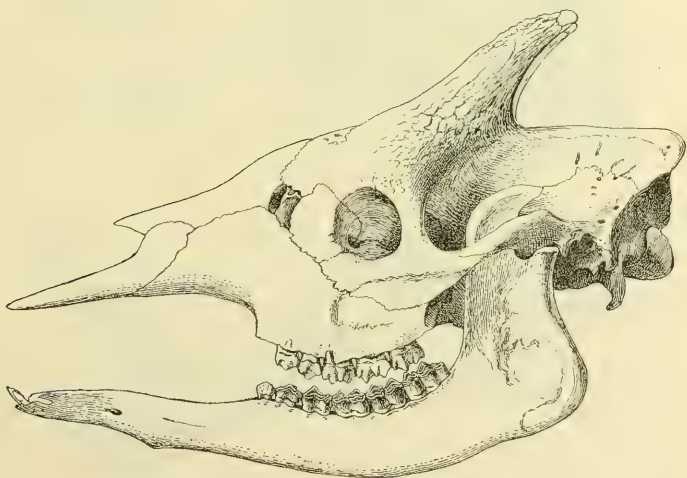
Dr. C. I. Forsyth Major, F.Z.S., informed the meeting that the remains of Okapi received by the Congo Museum in Brussels<sup>1</sup>, which he had lately had an opportunity of examining, consisted

Text-fig. 6.



Left side view of skull of *Samotherium boissieri* Maj., ♂, from Samos.  
 $\frac{1}{2}$  nat. size.

Text-fig. 7.



Left side view of skull of *Okapia liebrechtsi* Maj., ♂.  $\frac{1}{2}$  nat. size. From Mundalah, on the road from Mawambi to Beni (N.E. frontier of the Independent Congo State). Congo State Museum at Tervueren, mr. Brussels.

of the skin of a female and the almost complete skeleton of an adult male. A reduced photographic view of the skin and a

<sup>1</sup> See 'La Belgique Coloniale,' May 4th & 25th, 1902.

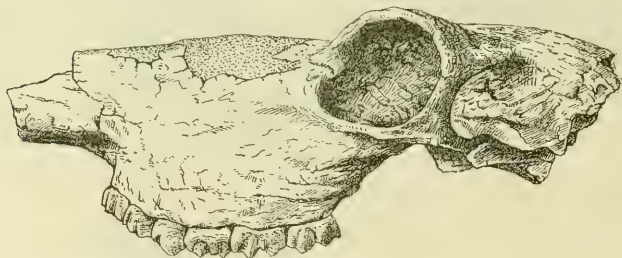


sketch of the natural size of the male skull were exhibited, and the following remarks were made:—

The new materials supply the eagerly looked for information as to the adult condition of the Okapi and the cranial differences between the two sexes. It will be remembered that even the larger of the two skulls received in London, which was believed to belong to the mounted skin, is that of a youngish individual, retaining most of the deciduous teeth, and that the sex of neither of the two skulls was established.

It will be further remembered that, although Sir Harry Johnston from the beginning very appropriately compared the Okapi with the *Helladotherium*, which is an early type of the Giraffidæ, and even assigned it to that genus, the predominating note of almost all the scientific, as well as the more or less popular, writings on the Okapi has been so far to regard it as a kind of degraded or degenerate Giraffe—a multiple armament of the skull being regarded as a primitive condition in Ruminants generally and in Giraffidæ in particular.

Text-fig. 8.



Left side view of incomplete hornless skull of *Palæotragus rouenii* Gaud., adult ♀. From Samos. Stuttgart Museum.  $\frac{1}{3}$ – $\frac{1}{4}$  nat. size.—This specimen is referred to in Geol. Mag. (4) viii. p. 354 (1901).—The inflated condition of the orbital roof is not so well shown as in the specimen text-fig. 9, owing to the different position in which the original photograph was taken.

Text-fig. 9.

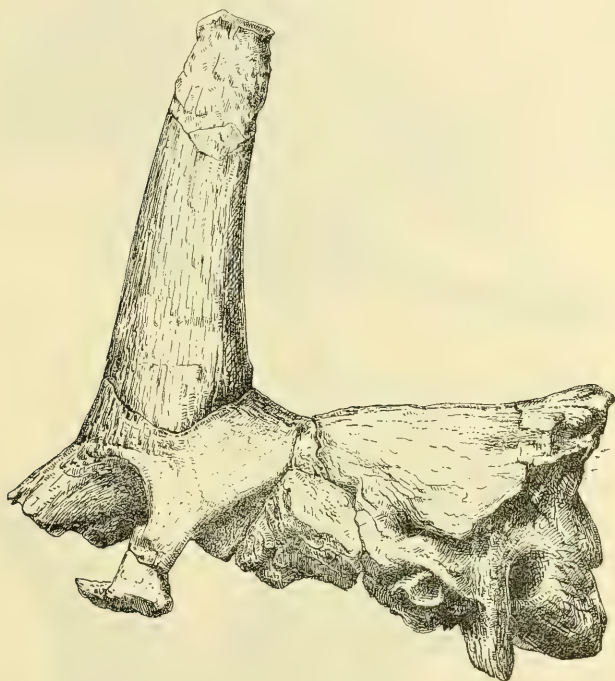


Cranial portion of hornless skull, left side, of *Samotherium boissieri*, adult ♀. From Samos. Collection of Monsieur William Barbey, Valleyres (Switzerland). About  $\frac{1}{4}$  nat. size.



At the bottom of this prevailing idea, which is disproved by all the teachings of palæontology, seems to be the very widespread belief, nurtured by popular works and by museum show-specimens, that all past faunas are made up of "extinct monsters"; whereas in reality in past times it is only a comparatively few highly specialized and decadent forms—ends of a series and not beginnings—that present such peculiarities—as to justify that name.

Text-fig. 10.



Cranial portion of skull of *Samotherium boissieri*, ♂, right side (reversed in the fig.).  
From Samos. Barbey Collection, no. 17. About  $\frac{1}{4}$  nat. size.

The, geologically speaking, most ancient undoubted Giraffidæ have been found in the uppermost Miocene of Pikermi, Samos, and Maragha; amongst them there is a group, assigned to two genera, *Palæotragus* and *Samotherium*, which possesses all the requisite characters of ancestors of the recent *Giraffa*. The females were hornless (text-figs. 8 & 9). In both sexes there is no trace of swelling at the root of the nasals, and the air-cavities generally are much less developed than in *Giraffa*, being chiefly limited to the roof of the orbits. The horns, where present (text-figs. 6 & 10), are restricted to the frontals, as in the new-born male of the northern Giraffe. The neck was comparatively short;

the limbs of moderate length, the anterior being scarcely longer than the posterior.

Text-fig. 11.



Skull of *Giraffa camelopardalis capensis*, ♂. Left side view.  
After de Winton (P. Z. S. 1897, p. 281, fig. 4).

Text-fig. 12.

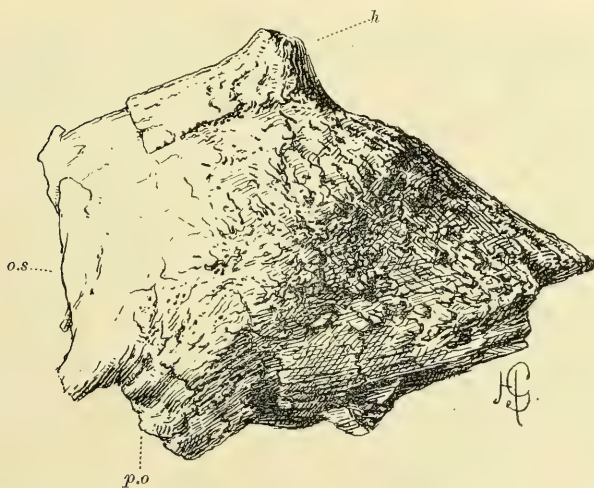


Skull of *Giraffa reticulata*, ♂. Left side view. After de Winton  
(P. Z. S. 1897, p. 280, fig. 2).

The new materials in the Congo Museum show that the adult Okapi is endowed with two frontal horns. In the female they are small, conical, inserted almost vertically, and completely covered by the skin. In the male they are larger, directed obliquely backwards and somewhat triangular; that the tips of the horns were not covered by skin seems certain, inasmuch as they have a polished appearance. There is no third median horn as in the skull of the northern Giraffe (text-fig. 12, p. 76); the osseous protuberance corresponding to this horn is in the Okapi (text-fig. 7, p. 73) less developed than in the Cape Giraffe (*Giraffa camelopardalis capensis*) (text-fig. 11).

We may say, in a general way, that the skull of the Okapi differs from the Giraffe skull in the lesser development of all the osseous protuberances and sinuses. In this respect the Okapi is intermediate between the Giraffe and *Samotherium*, as characterized above. Even in the adult *Samotherium* (text-fig. 13) the sinuses are much less developed than in a young Okapi still retaining most of the deciduous teeth.

Text-fig. 13.



Supraorbital portion of left frontal of *Samotherium boissieri* (adult ♀ or immature ♂?), showing a rudimentary horn-core. Nat. size. Samos. Barbey Collection, no. 712.—The specimen is referred to in Geol. Mag. (4) viii. p. 243 (1901), where it is erroneously assigned to the right side.

*h*=rudimentary horn-core; *o.s.*=upper margin of left orbit;  
*p.o.*=orbital process of frontal.

The Okapi is besides intermediate between these Miocene forms and the recent Giraffe in the *position* occupied by the frontal horns. In the *Samotherium* the horns, as mentioned, are situated above the orbits; they are situated slightly farther backwards in the Okapi, but stop at the coronal suture; whereas in *Giraffa* they encroach considerably on the parietals.

The four or five stages in the evolution of the Giraffine skull are therefore, beginning from the most generalized:—

1. Hornless—presumably female—*Palæotragus* (*Samotherium*) (text-figs. 8 & 9, p. 74).

1 *a*. Horned skulls of *Palæotragus* (*Samotherium*) (text-figs. 6, p. 73, & 10, p. 75); all presumably males.

2. *Okapia* (text-fig. 7, p. 73).

3. *Giraffa camelopardalis capensis* (text-fig. 11, p. 76).

4. *Giraffa reticulata* (text-fig. 12, p. 76).

As to the dimensions and proportions of the limbs and neck, the skeleton shows, still more conclusively than the skin, that the Okapi scarcely differed in this respect from the ordinary type of Ruminants.

In the Giraffe, as is well known, both fore and hind limbs are much elongated, the former longer than the latter. By adding together the longitudinal dimensions of the three principal bones in each of the limbs, viz., humerus, radius, and metacarpal in the anterior, and those of the femur, tibia, and metatarsal in the posterior, we arrive at the following proportions of the two:—

	Ant.	Post.	
Cape Giraffe (Gaudry) .....	2010	1835	= 1000 : 912·9
Abyssinian Giraffe (Brit. Mus.) ...	2256	2079·5	= 1000 : 921·8
Senegal Giraffe (Gaudry) .....	1770	1690	= 1000 : 954·8
Okapi .....	948	974	= 1000 : 1027
A species of <i>Palæotragus</i> ( <i>Samotherium</i> ) .....	1295	1304	= 1000 : 1007

In the Antelopes and Ruminants generally the hind limb is almost always longer than the fore limb; in some Antelopes, however, both have almost equal length, but the radius is always shorter than the tibia (*Gaudry*). Taking, therefore, the length of the radius as 100, we find the following proportions between the length of the radius and the tibia:—

	R.	T.
<i>Taurotragus oryx</i> .....	100	: 120
<i>Hippotragus equinus</i> .....	100	: 118·8
<i>Bos</i> .....	100	: 117
<i>Okapia</i> .....	100	: 99·7
Three species of <i>Samotherium</i> ( <i>Palæotragus</i> ) ...	100	{ : 98 : 97 : 95
<i>Helladotherium duvernoyi</i> from Pikermi .....	100	: 86
Senegal Giraffe .....	100	: 83
Abyssinian Giraffe .....	100	: 79
Cape Giraffe .....	100	: 75

The fore and hind limbs are therefore of about equal length in the Okapi, and the same may be said of the *Samotherium* group. In the Giraffe the fore limb is *longer*, and in Ruminants generally it is *shorter*, than the hind limb.

The longitudinal dimensions of the *cervical vertebrae* show the



neck of the Okapi to have had normal proportions ; in the mounted skin in the British Museum the neck appears to me to be a little too much stretched.

In conclusion, and in harmony with what I formerly have said here and elsewhere, the Okapi, far from being a degenerate Giraffe, is, in my opinion, a member of the Giraffidæ which in various respects has retained the characters of ordinary Ruminants. It is a stage towards the Giraffe, slightly less primitive than *Samotherium*, and occupying, on the whole, a perfectly intermediate position between the latter and the true recent Giraffes, which are an extreme.

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Mr. Edward J. Bles, F.Z.S., exhibited young tadpoles of *Xenopus laevis* Daud., the Cape Clawed Frog, under the microscope, to demonstrate the remarkable transparency of the head and the method of ingesting food, hitherto unknown in the Amphibia. The results obtained by Mr. F. E. Beddard (P. Z. S. 1894, p. 101) were confirmed. The presence of pectoral lymph-hearts from a very early stage and the absence of blood-vessels in the tail-fin of the young tadpole were briefly referred to.

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Mr. Lydekker exhibited the mounted head of a male Siberian Wapiti, *Cervus canadensis asiaticus* (Severtzoff), shot by Mr. J. Talbot Clifton in North Siberia. This Wapiti appeared to be entitled to subspecific distinction from the Thian-Shan Wapiti, *C. c. songaricus*, since the dark markings on the muzzle were different, and there also seemed to be certain differences in the antlers, which in the specimen exhibited had a relatively small spread, although they were very massive. In this connection Mr. Lydekker alluded to the head of a Wapiti from Chenkend (?=Chimkent), Turkestan, lately presented by the President to the British Museum. This specimen (No. 2.3.19.1) differed from both the Canadian and the Thian-Shan Wapitis by the whole margin of the upper lip being light-coloured, instead of only the front portion and a patch beside the nostrils, and also by the circumstance that the dark patch on each side of the lower lip did not extend downwards to join a larger patch on the chin, which in this specimen was uniformly light-coloured. Similar features occurred in the Deer from Turkestan to which the name *Cervus bactrianus* had been applied by Mr. Lydekker in 1900. And although that Deer had been regarded as allied to the Shou, Mr. Lydekker now believed its antlers were abnormal, and that it was really a Wapiti. This being so, the British Museum specimen probably belonged to the same form, which might be known as the Turkestan Wapiti, *C. canadensis bactrianus*. It was added that as the "moustache-markings" were constant in the different forms of Roe, they probably were likewise so in the Wapiti group. They were more convenient to describe than the antlers, although these also appeared to differ in the various Asiatic races of Wapiti.

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The following papers were read :—

1. The Wild Sheep of the Upper Ili and Yana Valleys.

By R. LYDEKKER.

[Received April 5, 1902.]

(Plates VII. & VIII.<sup>1</sup> and Text-figures 14 & 15.)

Among several other valuable specimens from the same locality, Mr. St. George Littledale has recently presented to the British Museum the head of a male Wild Sheep of the Argali group (Pl. VII. fig. 17), as well as the entire skin of a second individual of the same species, killed in one of the tributaries of the Ili Valley on the northern flank of the eastern Tian-Shan, some distance to the south-east of Kuldja or Ili. Both specimens are in the winter-coat; and the head is now mounted and exhibited in the lower mammal gallery.

As soon as the head was placed in its present position it became apparent that it could not be identified with any of the forms of Wild Sheep exhibited in the gallery, and as it is necessary that it should be named, I lay before the Society the present notes. It may be premised that, being unable to identify this sheep with any named form, I have given it a new subspecific name. This name must, however, be regarded as in some degree provisional, since this sheep may turn out to be inseparable from one of those named, but somewhat insufficiently described, by Severtzoff. To settle this point requires a journey to Moscow, which I am not at present prepared to undertake. It may be added that if the Ili sheep were identified with one of those named by Severtzoff, it would probably involve changing the name *Ovis sairensis*, applied by myself a few years ago to a wild sheep from the Saiar Mountains.

Before proceeding further it may be well to mention that Mr. Littledale has in his own possession the skull of the ram the skin of which he has presented to the Museum. This skull, as shown by the condition of its cheek-teeth, is that of a fully adult individual. The horns are practically similar to those of the Museum specimen, indicating that the latter is also fully adult, as indeed might be inferred from its large size. A skull (text-fig. 14), from Tarbagatai in the Altai, presented by Mr. Littledale in 1896 to the Museum (No. 96.2.6.9), agrees in the characters of the horns with the last-mentioned specimen, and evidently belongs to the same or a closely allied form.

Comparing the Ili specimen with the heads of adult rams of *Ovis ammon* and *O. poli* in the collection of the Museum (of the former of which a figure is given [text-fig. 15, p. 81] in order to facilitate the comparison), it will be seen to differ markedly from both in two respects. In the first place, instead of the entire

<sup>1</sup> For explanation of the Plates, see p. 85.







J.  
14

J. Smit del. et lith.

OVIS CANADENSIS BOREALIS.

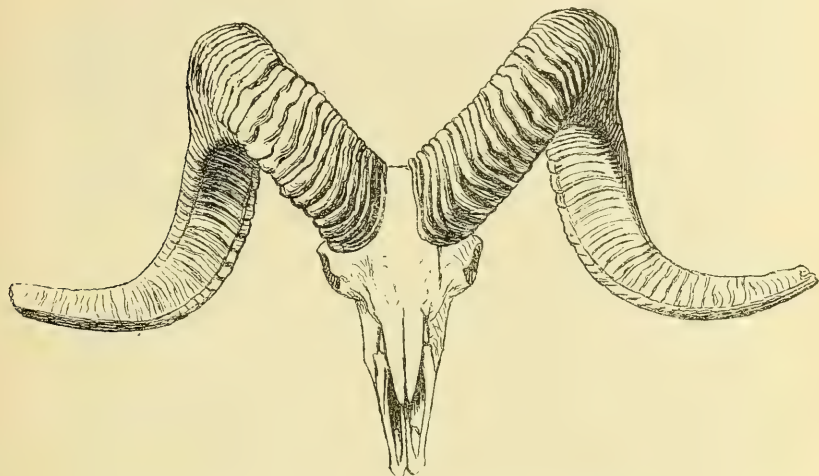
Mintern Bros imp.





head being of a "whity-brown" or dirty white colour, its upper portion is greyish brown, while the lower half is pure white. In the second place, the horns rise from the skull at a much greater

Text-fig. 14.



Skull of male of Little's Ili Sheep from Tarbagatai.

Text-fig 15.



Head of a male Siberian Argali from the Altai.  
(Blanford, Proc. Zool. Soc. 1896, p. 787.)

elevation, so as to be widely separated from the ears (which are rather small) instead of being overlapped by them.

The horns themselves are of a more massive and less elongated type than those of *O. poli*, and also markedly distinct from those of the variety *O. p. karelini*, of the western Thian-Shan, in which the front outer angle is, at least frequently, bevelled off. On the other hand, they are less massive and considerably more open than those of *O. ammon*, and therefore very much more so than in the Tibetan *O. a. hodgsoni*. In *O. ammon* the surface next the face tends to look upwards, whereas in the present form its tendency is to look downwards. A more easily recognized difference is that in *O. ammon* the horns are greatly "nipped in" just below the eyes, in consequence of which the transverse diameter across the eyes is very much less than it is higher up. In the present form, on the contrary, the horns are actually wider across at the level of the eyes than they are at the line of the crown of the head.

Such a "nipping in" is not apparent in *O. ammon hodgsoni*, in which the surface next the face is nearly vertical; and much the same is the case with the Sheep from the Saiar (or Jair) Mountains I have named *O. sairensis*<sup>1</sup>. In fact the Sheep under consideration appears to bear somewhat the same relationship to *O. sairensis*, so far as the curve of the horns is concerned, as is presented by *O. ammon* to *O. a. hodgsoni*, although the extreme openness and basal elevation of the spiral are unique. There are other differences (especially as regards the wrinkles) of the horns of the Ili Argali from those of the Siberian *O. ammon*, sufficiently apparent when the specimens are seen side by side, but almost impossible to describe.

With *O. sairensis* (Pl. VII. fig. 2) the head of the Ili Wild Sheep agrees very closely in general coloration, both forms having the forehead dark and the muzzle white; the white being, however, somewhat purer in the latter. The same type of face-coloration was presented at the time of its death by an Argali from the Altai or Thian-Shan, recently living in the Society's Menagerie, and figured when quite young (at which time the face was wholly dark) by the Secretary<sup>2</sup> as *O. ammon*. As I have elsewhere remarked<sup>3</sup>, that specimen differed from the typical *ammon* by the presence of a large white ruff on the chest; such a white ruff being also present in the winter coat of the Ili Sheep. As the Society's Argali was nearly full-grown at the time of its death, it appears to me very unlikely that it would ever have developed a uniformly whity-brown face (especially as *O. sairensis* has the face parti-coloured in youth as well as in the adult); and I am therefore inclined to think that it belonged to some form of the last-named species.

The Ili Sheep is a considerably larger animal than the typical *O. sairensis*, but (if colour be any clue to affinity) seems to come nearer to that species than to any of the named forms which can

<sup>1</sup> 'Wild Oxen, Sheep, and Goats,' p. 185 (1898).

<sup>2</sup> Proc. Zool. Soc. 1899, pl. viii.

<sup>3</sup> 'Great and Small Game of Europe, &c.,' p. 124 (1901).

be identified with certainty. I accordingly propose to regard it as a local race of that species, with the title of *O. sairensis littledalei*. The white muzzle and dark forehead serve to distinguish *O. sairensis* from both *O. poli* and *O. ammon*; and the typical Saiar race of the former species may be differentiated from the Ili race by its inferior size and the much closer spiral formed by the horns. I have elsewhere suggested that *O. sairensis* should be known in English as Littledale's Sheep; and the two races of the species may be severally distinguished as Littledale's Saiar Sheep and Littledale's Ili Sheep.

The description of a new subspecies is of but little interest unless some deduction can be drawn with regard to the habits or distribution of the group to which it belongs. In this case something of this nature can, I think, be suggested. A glance at the map of Central Asia will show that the Saiar and Ili Sheep occur approximately on the same great line of watershed; and that to the south-west *O. poli karelini*, of the western Thian-Shan, comes in on the same line, and thus continues the chain to the Pamirs, the home of the typical *O. poli*. Now all these four types of Sheep have horns with a longer spiral than that of *O. ammon* and its races, and their habitat appears to form a kind of wedge driven into that of the latter group. It is further noteworthy that among the Argalis the length and openness of the horn-spiral decrease from west to east, as exemplified by the occurrence of *O. poli* on the western and *O. ammon hodgsoni* on the eastern frontiers of the group. Nor is this all, for in the three species *O. poli*, *O. ammon*, and *O. sairensis*, the further east or the further south they go it is noticeable that the less open becomes the spiral of the horns. This is apparent when we compare *O. poli* with *O. p. karelini*, *O. ammon* with *O. a. jubata* and *O. a. hodgsoni*, and *O. sairensis* with *O. s. littledalei*. What may be the reason for this feature, I am unable to conjecture.

Admitting that the three species of Argali just mentioned are very closely allied, the question may be legitimately asked, why they and their subspecies are not all classed as phases of a single species, as is done in the case of the Wild Goats of the same region. To this it may be replied, that if such a course were adopted it would be necessary to employ quadrinomialism, in order to express adequately the mutual relationships of the forms here regarded as local races of the three species mentioned.

I may add that I have been told by more than one sportsman that all the Central Asian Argalis pass more or less completely into one another. Without denying the possibility that such may be the case, it is certain that no such transition is exhibited by the series of specimens in the British Museum.

I will now proceed to deal with a Wild Sheep recently brought by Mr. J. Talbot Clifton from Northern Siberia, at a point distant about 40 miles from the mouth of the Yana River.

The exact locality is the north-west end of the Verkhoyansk Mountains, forming the watershed between the valleys of the Yana and the Lena. The specimen which I exhibit this evening (Plate VIII.) is, I am glad to say, to be presented to the British Museum by Mr. Clifton. It is, I believe, the first example of its kind ever brought to England. There are, indeed, two heads of a white Bighorn Sheep in the possession of Mr. Rothschild (which, by the kindness of their owner, I am likewise enabled to exhibit this evening) said to be of Asiatic origin. These heads were brought by traders through Kamchatka, and in 'Wild Oxen, Sheep, and Goats'<sup>1</sup> I assigned one of them to the Kamchatkan form of Bighorn. Subsequently, however, I obtained evidences that the Kamchatkan Bighorn does not turn white in winter, and accordingly pointed out<sup>2</sup> that the identification was in all probability incorrect. I cannot identify either of these heads with the specimen under consideration.

The Wild Sheep of Northern Siberia appears to have been first described by Severtzoff<sup>3</sup> in 1873, under the name of *Ovis borealis*. His description, which is very brief and by no means satisfactory, is in Russian, but a translation in German was given by the late Prof. Peters<sup>4</sup> in 1876. The description is as follows:—"The specimens of this sheep, which were given by Mr. Schmidt to the Museum of the Academy of Sciences at Moscow, were obtained from the mountains and highlands of the Pjasina [Piasina] and Chatanga districts of Northern Siberia. They seem to me to indicate a form intermediate between *O. nivicola* and *O. argali*, but nearer to the former, from which they are doubtfully specifically distinct, and with which they may be identical. From *O. argali* they differ by their smaller horns, inferior size, and whitish belly."

It was subsequently stated that the locality of the type specimens is the mountains separating the valleys of the Nyjnaya and Tunguska from those of the Pjasina and Chatanga. The Tunguska, it may be well to mention, is a tributary of the Yenesei, but the Pjasina discharges into the Arctic Ocean somewhat east of the Yenesei in about long. 185° east.

The travellers Dr. A. Bunge and Baron E. Toll<sup>5</sup> identify with Severtzoff's *O. borealis*, which is considered inseparable from *O. canadensis*, a sheep found in the Verkhoyansk Mountains, and thence down the valley of the Lena to its mouth.

This sheep is undoubtedly the same as the one obtained by Mr. Talbot Clifton; and if the former be rightly identified with *O. borealis* (as is probably the case), the latter must likewise belong to that form.

The first point to mention is that Mr. Clifton's specimen shows no signs of affinity with the Argalis, but is in every respect a true

<sup>1</sup> Page 224.

<sup>2</sup> 'Great and Small Game of Europe, &c.,' p. 23.

<sup>3</sup> Trans. Soc. Moscow, vol. viii. art. 2, p. 153 (1873).

<sup>4</sup> Monatsber. Ak. Berlin, 1876, p. 180.

<sup>5</sup> See Beiträge Kennt. Russ. Reichs, ser. 3, vol. iii. p. 102 (1887).



Bighorn, perfectly distinct from the Kamchatkan representative of that group.

Compared with the Kamchatkan Bighorn, the Wild Sheep of the Yana is essentially the same type of animal; although its general coloration is decidedly lighter, there is a much greater proportion of white, and the dorsal streak and tail are much darker.

The Kamchatkan Bighorn may be roughly described as a nearly uniform grey-fawn animal, with a comparatively small white rump-patch, a certain amount of white on the muzzle, postero-internal sides of limbs, and under-parts, and a brown tail, which is remarkably short and broad. In the male of the Yana Sheep the white rump-patch is much larger, although it does not include the short and bushy tail, or extend on the buttocks above its line of origin. The face, too, is white, with the exception of a wood-brown transverse band midway between the nostrils and the eyes, which expands out to include each cheek. The whole nape is also white mingled with grey. An indistinct dark line runs down the back and becomes more distinct as it approaches the tail, which is blackish brown. There is also a larger proportion of white on the legs and under-parts. An important difference from *O. nivicola* is to be found in the markedly larger ears, which are very thickly haired.

A female head, brought by Mr. Clifton, is wholly greyish white, passing into pure white on the forehead and muzzle.

The skull presents all the features distinctive of that of the Kamchatkan Bighorn.

There can, I think, be no question but that the Yana Sheep is nothing more than a local race of the Kamchatkan Bighorn. And, although these two animals differ more from all the American Bighorns than do the latter from one another, I am of opinion that it is advisable to regard the whole group as local phases of a single variable type. If this view be accepted, the scientific name of the Siberian Bighorn will be *Ovis canadensis borealis*. So far as I know, no English name has been suggested for this sheep, which, I think, may be colloquially designated Clifton's Bighorn.

#### EXPLANATION OF THE PLATES.

##### PLATE VII.

Fig. 1. Head of Littledale's Ili Sheep (*Ovis sairensis littledalei*), from the type specimen in the British Museum.

2. Head of Littledale's Saiar Sheep (*Ovis sairensis*), from the type specimen in the British Museum.

Both figures one-fourth nat. size.

##### PLATE VIII.

Clifton's Bighorn (*Ovis canadensis borealis*), from the ram brought by Mr. J. Talbot Clifton from the Yana Valley.



2. Remarks on certain Differences in the Skulls of Dicynodonts, apparently due to Sex. By R. BROOM, M.D., B.Sc., C.M.Z.S.

[Received April 11, 1902.]

(Text-figure 16.)

In classifying the Dicynodont skulls from the Karroo deposits of S. Africa, one is at once met by the difficulty that scarcely two of them seem to agree in all respects. Even in a series of skulls from one stratum and one locality, and where the presumption is that a number at least must belong to the same species, the differences are such that one might readily incline to make each skull the type of a distinct species. Owen, in his 'Catalogue of S. African Reptiles,' describes 36 specimens of Dicynodont skulls, and these, he believes, represent 32 different species. Lydekker, in his British Museum Catalogue, recognizes among Owen's specimens only 18 good species and 4 which are doubtful.

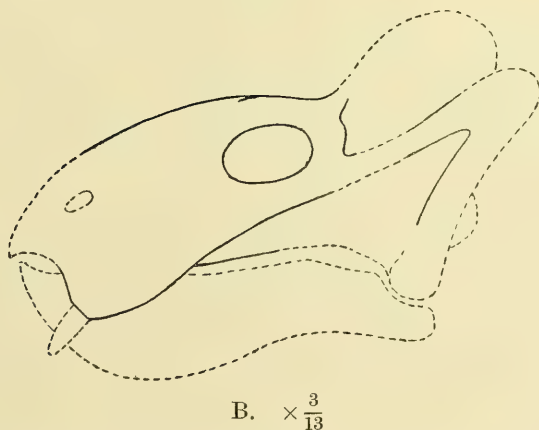
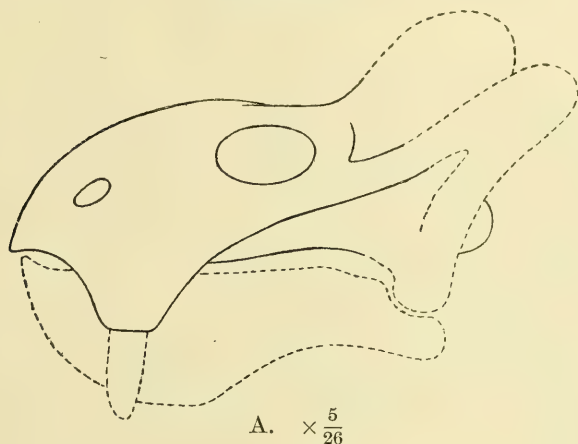
Though the difficulty in classifying Dicynodont skulls is to some extent due to the different ways in which specimens are crushed and to the imperfection of the specimens, it is mainly owing to our ignorance of the changes which may be produced by age and to the differences due to sex. Small Dicynodont skulls are found not more than 3 inches in length with well-developed tusks and well-ossified bones, which in their general characters resemble some of the largest skulls that have been discovered. Until a much greater number of specimens has been found, it will be impossible to decide definitely whether many of the small skulls are those of small species or of the young of the larger kinds. With regard to the differences due to sex, I have come across a few skulls which seem to give us some help.

In Port Elizabeth there is a Dicynodont skull in the collection of the Eastern Province Naturalists' Society, which differs very markedly from any previously described; and this I have described<sup>1</sup> as the type of a new species, *D. latifrons*. In the Gill College, Somerset East, is a large skull which I believe belongs to the same species, but which differs very strikingly from the Port Elizabeth specimen in the structure of the maxillaries and tusks. Both the skulls are from Burghersdorp, and agree in the following features:—The nasal region is very greatly developed and has a prominent median ridge; the frontal region is flat and exceedingly broad, causing the orbits to look directly outwards; the parietal crest rises sharply up from the frontal plane, making an angle of about 120° with it. In the Port Elizabeth specimen the tusk is feeble and is directed forwards almost in a line with the malar arch. Along the lower margin of the maxillary there passes backwards from near the root of the tusk a well-marked

<sup>1</sup> R. Broom, "On two new Species of Dicynodonts," Ann. S. Afr. Mus. vol. i. pt. 3, 1899, p. 452.

bony ridge, which is directed outwards and slightly downwards. In the Gill College specimen the tusk is very powerfully developed and is directed mainly downwards, and in connection with the great development of the tusk the maxillary is a very massive

Text-fig. 16.

Outline views of skulls of *Dicynodon latifrons*: (A) male and (B) female.

bone. Instead of the bony ridge seen in the Port Elizabeth specimen, we have here, in a similar situation, a great thickening of bone forming a tuberosity more than twice the width of the ridge in the other specimen.

As the two specimens are from the same locality and agree closely in most of their characteristic features, it seems reasonable to conclude that the differences in the maxillary development are due to sex; the male having the powerful tusk directed downwards, and the female the small tusk which is directed more forwards.

The accompanying drawings (text-figs. 16 A & 16 B, p. 87) delineate side views of the two specimens, partly restored. In the male the lower jaw has been restored from the jaw of *D. leoniceps*.

That the differences are due to sex receives confirmation from the skulls of other forms.

The type of Owen's *Dicynodon tigriceps* is a skull with a very powerful downwardly directed tusk. Near Pearston I have discovered a skull which, though imperfect, agrees closely with *D. tigriceps* in its posterior region, but the tusk is so inconspicuous that at first one would think the skull belonged to a species of *Udenodon*. As in the female *D. latifrons*, the tusk is directed as much forwards as downwards, and has a diameter of only half that of the tusk of the male (Owen's type), though the skull is even a little larger in the female specimen.

In *Udenodon*-skulls we find similar differences in the maxillary development—skulls with powerful downwardly-directed caniniform ridges, and skulls with feeble, flattened, forwardly directed maxillary processes. Owen's type of *Udenodon baini* is a good example of what I believe to be a male skull. The little skull which I have recently figured as the type of *U. gracilis*<sup>1</sup> is probably a fairly typical female skull. I have in my possession a skull which I believe to be that of *U. baini*, but which has a feeble maxillary very much resembling that in the type of *U. gracilis*. If it is not the female of *U. baini*, it must be of a new species; and as the differences in maxillary development are closely comparable to those seen in the two types of *Dicynodon*-skulls, one feels justified in concluding that the specimens with the feeble maxillæ are females.

Besides the differences in maxillary development, it is probable that when more perfect specimens are found a number of additional correlated characters will be discovered. The arches, so far as preserved, are undoubtedly more feeble in the female *Dicynodon latifrons*, and it is probable that the squamosal will be found to be less greatly developed than in the male. It is also highly probable that the lower jaw in the female is less massive than in the male.

<sup>1</sup> R. Broom, "On the Structure and Affinities of *Udenodon*," Proc. Zool. Soc. 1901, vol. ii. p. 162.

3. A Note upon the Gonad. Ducts and Nephridia of Earth-worms of the Genus *Eudrilus*. By FRANK E. BEDDARD, M.A., F.R.S., Vice-Secretary and Prosector of the Society.

[Received April 14, 1902.]

(Text-figures 17-20.)

(1) *Oviduct.*

Although a considerable number of memoirs have been published which deal entirely or in part with the female reproductive organs of *Eudrilus*, I am able in the present communication to add some new facts to what has been already ascertained. The original describer of the genus and of the organs in question was Perrier, whose account and figures are partly correct, though he mistook for the ovary the homologue of the receptaculum ovarum, or egg-sac as it is simpler to call this cavity which lodges the developing ova<sup>1</sup>. Later the structure of these organs was more correctly described by myself, the continuity of the sac containing ripe and developing ova with the undoubted oviduct being demonstrated; by Perrier the sac had been figured as attached to the wall of the spermathecal sac just at the point where the oviduct, termed by him "un tube . . . entortillé," and not identified as the oviduct, opens<sup>2</sup>. This was confirmed later by Dr. Horst, who added some details<sup>3</sup>. Neither Dr. Horst nor I saw the real ovaries in any of the specimens which we examined. Shortly after I found in the xiii<sup>th</sup> segment of some examples of the genus from British Guiana, a pair of cellular bodies lying in the usual position that is occupied by ovaries, and wrapped in a small sac which I found to open into the duct of the spermathecal sac<sup>4</sup>. Dr. Horst's investigations finally settled the matter, and proved conclusively that the cellular bodies in the xiii<sup>th</sup> segment of *Eudrilus* are ovaries<sup>5</sup>. I thought, however, that this genus possessed two pairs of ovaries, those of the xiii<sup>th</sup> segment, and a pair in the xiv<sup>th</sup> which have become involved in the egg-sac. This view is also taken by Eisen, who has made the latest contribution to the subject, and whose figure of the female reproductive system in this annelid is the best with which I am acquainted<sup>6</sup>.

I believe that we are now, owing to these various memoirs, in possession of accurate information concerning the organs in question in the sexually mature *Eudrilus*. But there is not at present any certainty as to the correspondence of the several parts of the complicated apparatus with corresponding regions in the equally complicated female organs of the other Eudrilidæ.

<sup>1</sup> Nouv. Arch. du Muséum, viii. (1872) p. 71.

<sup>2</sup> Zool. Anzeig. 1886, no. 224; Proc. Roy. Soc. Edin. xiii. (1885-86) p. 672.

<sup>3</sup> Notes from the Leyden Museum, ix. p. 247.

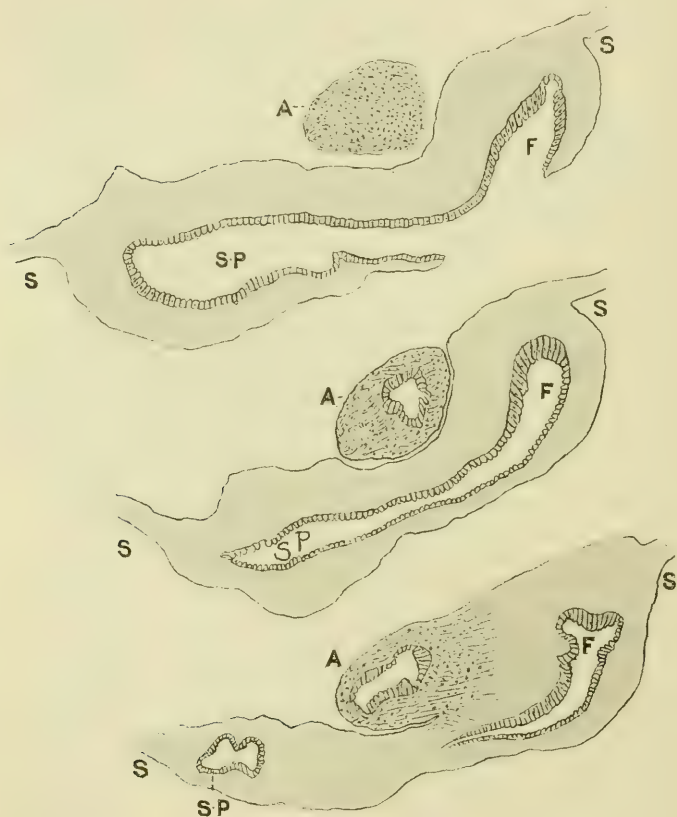
<sup>4</sup> Zool. Anzeig. 1888, no. 293; P. Z. S. 1887, p. 372.

<sup>5</sup> Mém. Soc. Zool. France, iii. (1890) p. 223.

<sup>6</sup> Proc. Calif. Acad. Sci. ii. (3) 1900, p. 135.

Indeed, the genus *Eudrilus* at present seems to be rather exceptional in the structure of these organs. No one, so far as I am aware, has traced out the development of the various ducts and pouches of the generative organs, by which alone a clear idea of the homologies of those parts can be acquired. It is this part of the subject to which I desire to draw attention in the present communication. I have studied three series of longitudinal

Text-fig. 17.



Series of three sections through the immature female generative system of *Eudrilus*, highly magnified. The sections follow in order from above downwards.

S, septum dividing segments xiii./xiv.: F, oviduct; A, receptaculum ovorum;  
S.P., spermathecal sac.

In section 1 the oviduct and spermathecal sac open into the coelom.

sections through the generative region of immature and quite small examples of a species of the genus *Eudrilus*, which, on account of their immaturity, I have been unable to identify. So



far as the anatomical characters allow me to guess, the species does not seem to be at all different from *Eudrilus eugeniae*.

Both Drs. Horst and Eisen, as well as myself, have stated, or at least assumed, that the spermathecal sac of *Eudrilus* opens on to the exterior by the laterally placed and paired orifices upon segment xiv., and that the oviducts open each one of them into the spermathecal sac some little way in front of the external pore of the latter. This idea is illustrated in a graphic form by Eisen, who colours the spermathecal sac blue and the oviduct pink; he also speaks of the oviduct as opening into the spermathecal sac. This idea, which has been thus generally accepted, is nevertheless totally wrong<sup>1</sup>. In the youngest example of this worm which I

Text-fig. 18.



Continuation of the series represented in text-fig. 17. Lettering as before.

In section 1 the branch from the receptaculum (A) has nearly joined the oviduct (F); in section 2 they are completely fused.

have had the opportunity of studying, the septum dividing segments xiii./xiv. was thickened considerably in the region which is occupied by the female efferent system. There were no pores upon the exterior of segment xiv. in the place where those exceedingly conspicuous orifices are to be seen in the mature worm. But a careful scrutiny of the sections (text-figs. 17 & 18) in order,

<sup>1</sup> It may be pointed out, however, that Dr. Horst letters the combined duct which leads from the oviduct and spermathecal sac to the exterior "ov." which, in the explanation of the lettering, is stated to signify oviduct. See *loc. cit.* Mém. Soc. Zool. France, pl. viii. fig. 14.

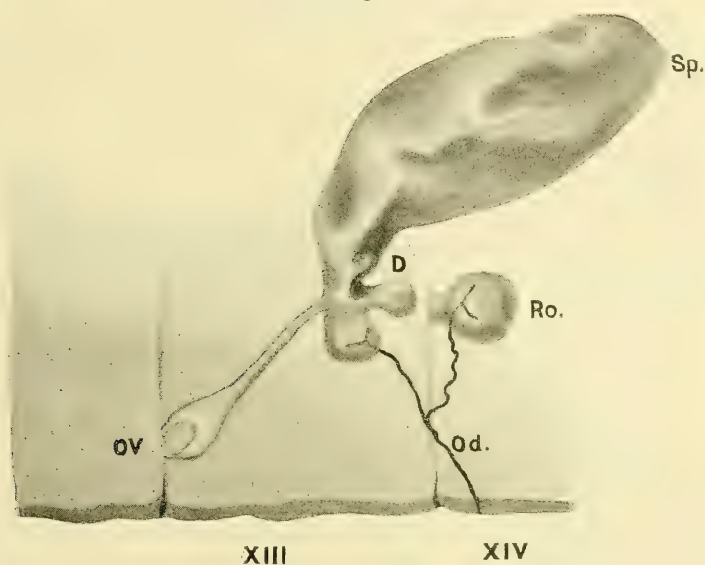
shows that a tube of feeble dimensions and with a thick muscular coating nearly reaches the exterior at a point not far off the lateral setæ of that segment. This tube actually perforates the body-wall for a certain (short) distance, and is undoubtedly the tube which afterwards opens at the same spot, and has been regarded as the narrower, distal, part of the spermathecal sac. Traced in the opposite direction, this tube approaches the thickened septum which separates segments xiv./xiii. It enters into the thickness of that septum and traverses it obliquely and dorsally in direction. At or about the middle of the septum the tube gives off a branch, or is joined by another tube, which also passes obliquely through the septum and in a short straight course. The direction is, however, back again towards the lumen of segment xiv. This second tube ends in a smallish rounded body, whose interior is divided up by trabeculæ, and which is plainly the receptaculum ovarum or egg-sac. It seems to be clear, therefore, that the two tubes together constitute the oviduct of the mature worm which, as is well known, opens into the egg-sac. But in this case, we should have the anomaly of the oviduct being connected with the egg-sac alone, as indeed Eisen states to be the case in the sexually mature worm. The anomaly, however, does not exist. The two tubes that we have been just considering open almost immediately, after their junction the one with the other, into the cavity of the xiiiith segment in common with a sac which extends dorsally, as well as ventrally, for a short distance. It might be said, indeed, that the mouth of the two tubes is rather into the sac, which then, in its turn, opens into the cœlom of segment xiii. At the point of opening, the columnar epithelium lining the tube becomes more pronounced, and this region may be looked upon as the funnel of the oviduct. In fact, we have in the immature worm an oviduct which opens into the xiiiith segment on the one hand, and on to the exterior on the other, a branch being given off to the egg-sac on the way from the internal to the external orifice. The genus *Eudrilus*, therefore, is not exceptional among Eudrilidæ; the oviduct, as in at least many genera<sup>1</sup>, communicates with the exterior by a pore on the xivth segment quite independently of the spermathecal sac; at the other end it divides into two tubes, one of which opens by a funnel into the egg-sac, the other by another funnel into a part of the system of sacs involving the ovary. This statement of course refers to the adult worm, in which the spermathecal sac is closed from the body-cavity. The spermathecal sac therefore of this genus is, as in other Eudrilidæ, a part of the egg-conducting apparatus, here simpler than elsewhere. The spermathecal sac has no orifice of its own to the exterior: it merely opens indirectly through the medium of the oviduct, just as do the sacs involving the ovaries in the genus *Stuhlmannia*<sup>2</sup>. But in the last-mentioned genus there is, in addition, an entirely independent orifice of the system of egg-

<sup>1</sup> See Beddard, P. Z. S. 1901, vol. i. p. 354.

<sup>2</sup> Beddard, *loc. cit.*

conducting sacs on to the exterior by a median unpaired pore. Of this there is no trace in *Eudrilus*, which therefore, so far, is more closely allied to *Nemertodrilus* than to any other form whose anatomy has been adequately studied. But in *Nemertodrilus* the large sac, which is clearly equivalent to the spermathecal sac of *Eudrilus* and other genera, is permanently open into the cavity of segment xiii. This represents an immature condition such as is transitory in *Eudrilus*.

Text-fig. 19.

Diagrammatic representation of female reproductive system of *Eudrilus*.

*D*, gland appended to spermathecal sac; *Od.*, oviduct; *Ov.*, ovary;  
*Ro.*, receptaculum ovarum; *Sp.*, spermathecal sac.

The accompanying diagram (text-fig. 19) will therefore represent more accurately than the hitherto published figures the distinctions between the different regions of the egg-conducting apparatus in *Eudrilus*. There are two other points with which I wish to deal before leaving the female efferent apparatus. In the first place, I have found in these immature worms no trace of the "oviducal gland" attached to and opening into the spermatheca in adult examples of the worm. The second matter has to do with the ovaries and the sacs in which they are enwrapped. It is noteworthy that in these young worms the ovary was many times larger than the testes; and that, while the latter showed no developing sperm in their neighbourhood or in the sperm-sacs, the cells of the ovary contained some very large and nearly fully

developed ova. It appears to me that this dichogamy, resulting in the earlier maturation of the female gonad, has a relation with the complicated condition of the efferent apparatus. I have on former occasions dwelt upon the difficulty of the transit of the eggs into the egg-sac of the xivth segment, and used that difficulty as an argument in favour of regarding the egg-sac as really representing a second ovary which has become involved by the sac. This view I abandon so far as concerns *Eudrilus*; for in the young stages, when the egg-sac is empty of eggs, there is no trace of any ovary in the segment which contains it. In the adult worm, the tract of oviduct which lies between the egg-sac and the junction of the oviduct with the branch that opens into the egg-conducting apparatus is long and much convoluted. This is well shown in Eisen's figure referred to.

In the immature worm the transit would be comparatively short and not hampered, moreover, by any ciliary action. This consideration, coupled with the early development of the female sexual cells, appears to me to have some significance. The ovaries in the most immature worm which I have examined were enclosed in a sac arising from the septum lying between the xiith and xiiith segments. This sac was apparently completely closed. In slightly more mature stages the sac of one side was prolonged into the short tube which I, Dr. Horst, and Dr. Eisen have described in the adult worm. I ascertained that this egg-tube opened into the spermathecal sac; but, in addition to this, the tube gave off a branch which crossed the body-cavity above the ventral blood-vessel, and opened into the spermathecal sac of the opposite side of the body. The ovary of that side was enclosed in the usual sac, which was not prolonged into an egg-tube. This state of affairs, whether normal in the species, or only occasionally to be met with, recalls the more usual characteristic of the Eudrilide. In other genera, for example in *Heliodrilus*<sup>1</sup>, the same communication between the ovary and both spermathecal sacs occurs by a slender tube crossing over the nervous system and ventral blood-vessel.

## (2). *Sperm-ducts.*

The anatomy of the male efferent organs in the adult *Eudrilus* has been also fully described by the authors quoted above. But here, again, nothing up to the present time is known of the condition of the various parts of this system in the immature worm. I find that the spermiducal glands are in the form of a single tube, with no division of the lumen such as exists in the glandular tube of the sexually mature individual. It seems, therefore, that the double spermiducal gland of the adult is not formed by the fusion of two distinct tubes, but that the division is secondary. There is naturally no terminal sac into which this

<sup>1</sup> Quart. Journ. Micr. Sci. xxxii. (n. s.) pl. xix. fig. 41.

opens, nor any trace of the penis or of the cushion-like pad on to which opens the duct of the "U-shaped tube." The latter, which is distinctly composed of two tubes, opens after the two tubes have united into the terminal section of the spermiducal gland just before the opening of the latter on to the exterior.

I may finally observe, with regard to the spermiducal glands, that the duct of the nephridium opens in common with the duct of that gland, as is also the case with *Heliodrilus*<sup>1</sup>.

### (3) *Nephridia of Genital Segments.*

I do not think that it has been pointed out that the nephridia of *Eudrilus* are imperfect in the xith, xiith and xivth segments. The nephridia of those segments have no funnel opening into the segment in front. It is of course proverbially difficult to prove a negative. But, in this case, the funnels when present are so extremely conspicuous, that it is not easy to understand how they can have been missed if really present in the segments where I believe them to be deficient. Moreover, the funnel when present is sufficiently large to appear in four, or even five consecutive sections. In no instance—and I have carefully examined both sides of the body of three examples—was there the faintest trace of anything that could be put down to even the degenerate rudiment of a funnel. The persistence or non-persistence of nephridial funnels in those segments which contain the funnels of the gonaducts has not been much enquired into; so far, at least, as concerns the terrestrial Oligochæta. In the majority of the aquatic forms the entire nephridium of the segments concerned vanishes on the appearance of the gonaducts. I published some years since<sup>2</sup> several reasons for believing that in *Octochaetus multiporus* the funnels of the nephridia belonging to the genital segments were actually converted into the gonaduct funnels. On theoretical grounds only my contention has been questioned by Mr. Goodrich<sup>3</sup>. In his opinion, and to this view Prof. Lankester has given in his adhesion<sup>4</sup>, there can be no connection between the funnels of the two kinds of tubes, inasmuch as the gonad-funnels are morphologically different from the nephridial funnels, being the internal apertures of the "cœlomo-ducts." That cœlomo-ducts quite distinct from nephridia exist in the Oligochæta I fully believe; but I am not convinced that they are the oviducts and sperm-ducts. As real cœlomo-ducts I reckon the pores upon the xiiiith segment in *Nemertodrilus*, the "spermathecal sac" and its external orifice in *Lybiodrilus*, and a variety of similar structures which are in effect ducts leading from the cœlom to the exterior. Nor can there be any possible confusion between such structures and nephridia. It may be readily admitted that

<sup>1</sup> *Loc. cit.* pl. xix. fig. 40.

<sup>2</sup> *Quart. Journ. Micr. Sci.* xxxiii. (n. s.) p. 495.

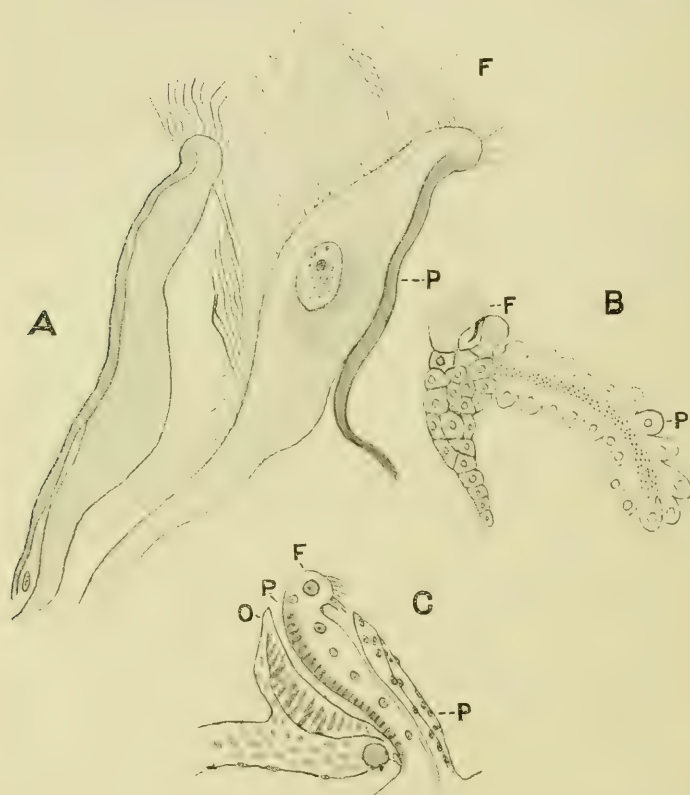
<sup>3</sup> *Op. cit.* xxxvii. (n. s.) p. 491.

<sup>4</sup> A Treatise on Zoology : edited by E. Ray Lankester, part ii. p. 13.



the absence of nephridial funnels and the presence of gonad-duct funnels, in segments x., xi., xiii., does not of itself prove that the former have been converted into the latter. But the facts are

Text-fig. 20.



**A**, nephridial funnel of *Branchiobdella* (after Moore).

F, funnel-cell; P, peritoneal cell.

**B**, developing nephridium of *Rhynchelmis* (after Vejdovsky).

F, funnel; P, vesicular region of nephridial cells.

**C**, funnel and subducal funnel of *Allolobophora* (after R. E. Bergh).

F, nephridial funnel; P, peritoneum; O, sperm-duct funnel.

not at variance with such an assumption. Bergh and Lehmann have both pointed out that the nephridial funnels of *Lumbricus* (*sensu lato*) persist for a longer or shorter time in the segments

into which the funnels of the gonad-ducts open. This fact appears at first sight to be fatal to my hypothesis. I am not, however, convinced that it is necessarily so. In Dr. Bergh's figure<sup>1</sup> illustrating the first origin of the funnel (text-fig. 20, C, p. 96), it will be noticed that this sperm-duct funnel originates as a thickening of the peritoneal covering of the nephridial funnel. Here it may be urged that the peritoneal covering of the nephridium is not the funnel itself, but a layer simply enwrapping it, and not related to it any more than is the peritoneal covering of the kidney in a vertebrate to be looked upon as a part of the kidney itself. It may be pointed out, however, that what is called "peritoneum" in these Annelids is apparently not quite to be compared to the cellular lining of the coelom in a vertebrate in every case. For example, in *Rhynchelmis* Vejdovsky has shown<sup>2</sup> (text-fig. 20, B, p. 96) that the vesicular cells involving the nephridium are derivatives of the actual nephridium itself, and not of any peritoneal covering. The nephridium, in fact, is not covered by a layer independent of itself. An even more striking fact is afforded by the condition of the nephridial funnel in the Discodrilid *Branchiobdella*. In a species of this genus, Mr. J. P. Moore<sup>3</sup> has figured (text-fig. 20, A, p. 96) an absolute continuity between the cells of the small funnel of that worm and a long thin cell enveloping the funnel outside and thus presenting the appearance of a peritoneal layer. Mr. Moore has remarked not only upon the "direct continuity" of these cells, but also upon the resemblance of the nucleus of this "peritoneal" cell to those of the funnel-cells which "is very striking." It appears to me that these various considerations show that it is at least premature to regard the gonad-funnels of the Oligochaeta as essentially different from the nephridial funnels. None of the facts which I have called attention to here are at variance with the older view of the intimate connection between nephridia and genital ducts in the Oligochaeta.<sup>4</sup>

<sup>1</sup> Zeitschr. f. wiss. Zool. xlv. pl. xxi. fig. 19.

<sup>2</sup> Entwicklungsgeschichtliche Untersuchungen, 1888-92, pl. xxvi. figs. 11, 12, 13.

<sup>3</sup> Journ. Morph. xiii. pl. xxi. fig. 10.

<sup>4</sup> The connection between the gonad-funnels and the nephridial funnels may be indeed not without analogy to the connection between certain cartilages in the vertebrate skeleton with subsequent ossifications. The line between membrane-bone and cartilage-bone is not always plain and easy to draw, and there are cases where a bone originally formed in cartilage comes to be later a product in part or entirely of membrane independent of the cartilage. A condition of apparently total independence is thus produced, which masks the real connection. This is possibly the case with the bones investing the palato-pterygoid arch in the higher vertebrates. And other instances might be quoted from this and other organs and systems.

4. On the Marine Spiders of the Genus *Desis*, with  
Description of a new Species. By R. I. Pocock, F.Z.S.

[Received May 22, 1902.]

(Text-figure 21.)

In this paper an attempt has been made to collect what is known of the habits of the marine or, more strictly speaking, littoral Spiders belonging to the genus *Desis*. It has been impossible to give a full account of the specific characters of all the known forms, since only four out of the seven described species are actually known to me. For the remainder I have been dependent upon the figures and descriptions published by other authors.

I have already pointed out (Ann. Mag. Nat. Hist. (6) xvi. p. 143, 1895) the identity between the so-called genera *Desis*, *Dandridgia*, and *Robsonia*, and Simon has subsequently and independently confirmed the synonymy of *Desis* and *Robsonia* (Hist. Nat. Araign. ii. p. 228, 1898). The genus *Paradesis* was instituted for the reception of the two S. African species of the same group, which differed from the species recorded up to that time from the Indo- and Austro-Malayan and New Zealand seas in the wider spacing of the eyes and the weak spine-armature of the legs—characters which, taken in conjunction with the geographical distribution of the two sets of species, appeared a sufficient basis for the establishment of the genus *Paradesis*.

A few months ago, however, the British Museum received from Miss Kenyon a specimen of a marine spider which was discovered on the coast of Victoria, in Australia. Curiously enough, this spider in the spacing of its eyes approximates to the South African species; and in the spine-armature of its posterior legs is also more nearly allied to the latter than to the known New Zealand and Austro-Malayan forms.

Since, therefore, no reasons based upon geographical grounds can now be alleged in support of the genus, I propose to drop *Paradesis* as a synonym of *Desis*, on the supposition that additional intermediate forms between the two types will in all probability be discovered in the Australian seas, and also because, so far as the spine-armature of the legs is concerned, the two South African species appear to differ from each other more than one of them does from the new Australian species.

Genus *DESIS* Walck.

*Desis* Walckenaer, Ins. Apt. i. p. 610 (1837).

*Dandridgia* White, Proc. Zool. Soc. 1847, p. 5.

*Robsonia* O. P. Cambridge, Proc. Zool. Soc. 1879, p. 686.

*Paradesis* Pocock, Bull. Liverpool Mus. i. p. 75 (1898).

In case it may be found possible and desirable in the future to resuscitate any or all of the above-given generic names, it is

advisable to point out what are the type-species to which these names must remain affixed:—

The type of the genus *Desis* is the species represented by the specimens (? in the Paris Museum) described by Walckenaer as *Desis dysderoides*.

The type of the genus *Dandridgia* is the species represented by the specimen in the British Museum described by White as *Dandridgia dysderoides*.

The type of the genus *Robsonia* is the species represented by the specimen in the Rev. O. P. Cambridge's collection described as *Robsonia marina*.

The type of the genus *Paradesis* is the species represented by the specimen in the British Museum described as *Paradesis tubicola*.

# 1. *DESIS MARTENSI* L. Koch.

*Desis martensi* L. Koch, Die Arachn. Austral. p. 347, pl. xxix. figs. 2–29 (1872); T. G. Workman, Malaysian Spiders, no. 11, p. 74 (1896).

*Loc.* Singapore; Pulo in the Java Sea.

The British Museum has specimens of this species from Singapore (*Major Archer*, *Lieut. Kelsall*, and *P. F. Bedford*).

*Lieut. Kelsall's* specimens, which were forwarded by Mr. H. N. Ridley in 1890, were accompanied by the following information:—“From the holes bored in the coral rock by a species of *Lithophaga*. From Buran Durat Reef near Blacku Mati Island. Nearest land  $\frac{1}{2}$  mile distant. Reef uncovered at half-tide.”

The announcement of the discovery by Dr. von Martens that this spider is truly marine elicited the following expression of opinion from Dr. C. L. Koch, to whom the specimens were submitted for description:—“[The spider] was collected by [Dr. von Martens] on coral-reefs at Singapore. . . . The species is remarkable in that it has established itself in these reefs, which are only temporarily uncovered by the sea. . . . That the species discovered by Dr. E. von Martens and Dr. Johswick can really, like our indigenous *Argyroneta aquatica* Cl., live under water, is to me doubtful in the highest degree, for it is wanting in the outward visible signs of the breathing apparatus which corresponds to such submarine mode of life, and which has been anatomically demonstrated in *Argyroneta aquatica*<sup>1</sup>. It also speaks against it, that yet another species of spider, an *Attus*, was found on the same coral-reefs, and we may assume with all certainty that this is a true terrestrial form. I opine that these spiders, perhaps in former times, were floated in an accidental manner from the land to these reefs and now live in the holes of the coral-bank, within which they withdraw at the time of flood, and which they close

<sup>1</sup> This is scarcely true, for, as I have pointed out (Ann. & Mag. Nat. Hist. (6) xvi. p. 143), *Desis martensi* has the tracheal slit large and well in advance of the spinners, though not so far forwards as in *A. aquatica*.

against the entrance of the water with a thick web. . . . When once both sexes had been transferred to the coral-reefs, the species would increase and form a colony there."

Dr. Koch subsequently received the following further information from Dr. von Martens:—"During my residence at Singapore in October 1861, I repeatedly visited a coral-bank in the neighbourhood of New Harbour, of which large tracts were exposed above water during the ebb, at the time of new and full moon. My attention was chiefly directed to Crustacea and Mollusca; I tore off pieces of coral and broke them up to get at the creatures hidden within. To my astonishment, I several times observed spiders hurriedly escaping. The idea occurred to me at first that we ourselves had brought them from the shore in our clothing. . . . This suspicion was rendered unlikely by the frequent repetition of the event, and was conclusively disproved, as Dr. Johswick found a web of undoubtedly one of these spiders in an old dead mussel-shell between the coral, stretched sheet-like in the cavity of the shell" (C. L. Koch, *Die Arach. Austral.* pp. 349-350). Dr. Koch had previously discussed the discovery of the marine habits of this Spider.

Mr. T. G. Workman (*Malaysian Spiders*, pt. 10, p. 74, 1896) writes of this species:—"This spider was discovered by me on the Blacku Mati coral-reef off the New Harbour, Singapore, the place where it was first discovered by Dr. Martens in 1861. I found it was perfectly helpless when placed in a bottle of water, showing in every way that it was not in its natural element. It lives in holes made by a species of *Lithodomus*, and spins a matted web across the hole and so keeping an air-chamber for itself during flood-tide. It is found in considerable numbers, but as it runs with great rapidity, is very hard to catch."

## 2. *DESIS MAXILLOSA* (Fabr.).

*Aranea maxillosa* Fabricius, *Ent. Syst.* ii. p. 411 (1793), teste Schiödt.

*Desis dysderoides* Walckenaer, *Ins. Apt.* i. pp. 610 & 682, pl. iv. fig. 151 (1837), also ii. p. 483 (1837); L. Koch, *Die Arachn. Austral.* p. 347 (1872).

*Desis maxillosa* Simon, *Hist. Nat. Araign.* ii. p. 225, figs. 215-217 (1898).

*Loc.* New Guinea (*Quoy & Gaimard*); Vanikoro (sec. *Simon*); Santa Cruz<sup>1</sup> Island in the Melanesian Archipelago to the north of the New Hebrides (*Fabricius*).

Habits unrecorded. No specimen in British Museum. The characters of this species given below are taken from Simon's figures.

<sup>1</sup> Fabricius gives St. Crux Island (Dr. Pflug) as the locality of this species. This is presumably the Santa Cruz Island in the Melanesian Archipelago. It must be borne in mind, however, that there is an island of St. Croix close to Port Elizabeth in South Africa, which is also the home of *Desis*. Is it not possible therefore that *maxillosa* Fabr. was based upon a South African species?



3. *DESI* *VORAX* L. Koch.

*Desis vorax* L. Koch, Die Arachn. Austral. p. 345, pl. xxix. figs. 1-1*f* (1872).

*Loc.* Upolu, in the Samoa Archipelago.

Habits unrecorded. No specimen in British Museum. The characters given below are taken from L. Koch's figures.

4. *DESI* *MARINUS* (Hector).

*Dandridgia dysderoides* White, Proc. Zool. Soc. 1849, p. 5 (nec *Desis dysderoides* Walck.).

*Argyroneta marina* Hector, Tr. N. Zealand Inst. x. p. 300 &c. (1877) (in note to paper by C. H. Robson).

*Desis robsoni* Powell, Tr. N. Zealand Inst. xi. pp. 263-268, pl. xii. (1879).

*Robsonia marina* O. P. Cambridge, Proc. Zool. Soc. 1879, p. 686.

*Desis marinus* Pocock, Ann. Mag. Nat. Hist. (6) xvi. p. 143 (1895).

*Loc.* New Zealand (Cape Campbell) and E. Australia (Port Jackson); also New Caledonia (sec. *Simon*).

The only specimen the British Museum possesses of this species is the type of *Dandridgia dysderoides* from New Zealand (*Erebus & Terror*). I have, however, examined a specimen of apparently the same species belonging to Mr. H. R. Hogg, F.Z.S., which was taken between tide-marks in Port Jackson. It is probably this species, rather than the one described below as *D. kenyonæ*, that Mr. Whitelegge refers to in the following terms: "There is a very common species of spider found under stones about low-water mark. It appears to be covered with a short pubescence which prevents the salt water from wetting the body." Watson's Bay and Taylor Bay in Port Jackson. (See Journ. R. Soc. N. S. Wales, xxiii. p. 233.)

The original account of this species given by Mr. Robson runs as follows:—

" . . . . I found a veritable spider [at Cape Campbell] quite at home under the water, and having a nest in an old *Lithodomus*-hole, of which the rocks are full. All the spiders of this kind which we have found have had nests in these holes, and always under water at all times of the tide. Over the mouth of the hole the spider spins a close web, which when finished looks like a thin film of isinglass and is water-proof; and behind the film is the nest and egg-sac, which last is of various shapes and contains a large number of eggs. When the spider is disturbed, it goes to the bottom of the pool, and if a small stick or straw is extended to it it at once gets ready for a fight, advancing its long and powerful mandibles for that purpose. When a small fish is placed in a bottle of water with one of these spiders, the latter will attack it at once, driving its long sharp falces into the fish near the head and killing it instantly. Each spider seems to live in

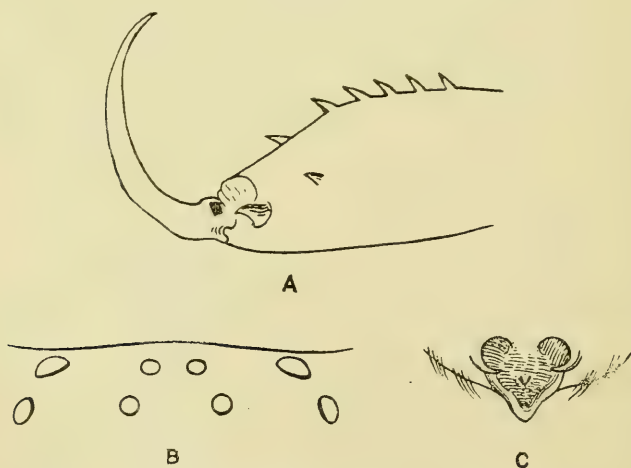
a solitary state, and it is, I believe, an exceedingly pugnacious little animal . . . .”

Mr. Robson subsequently supplied Dr. Powell with the following additional observations :—“The nests of this spider do not, in my opinion, occur below low water ; but it is difficult to state positively. The mouth of the *Lithodomus*-hole in which the nest is made is often, if not always, under low water in a tidal pool, and the nest is only to be got at by breaking up the rock with a heavy hammer. The spider when going to the bottom of the pool, on being disturbed, does not take down an air-bubble so far as I could see, and is able to live a considerable time without air or only the small amount to be found in sea-water. I have kept them alive for several days in a bottle quite full [of water]. The cocoons of eggs are found at the end of the hole and always quite dry. I have not seen these spiders at any place but Cape Campbell, and then not far above low-water mark, there being many feet of water over the rocks in which they live at high tide.”

5. *DESIS KENYONÆ*, sp. n. (Text-fig. 21.)

*Colour* normal ; carapace and mandible yellowish red ; legs and abdomen olive-yellow, sternum more uniformly testaceous than the carapace, the scopula on the protarsi of 2nd, 3rd, and 4th legs showing as dusky patches.

Text-fig. 21.



*Desis kenyonæ*.

A, lower side of the left mandible, to show the arrangement of the teeth.

B, eyes viewed from above, the anterior edge of the carapace uppermost.

C, vulva.

*Carapace* low, a little longer than tibia of 1st leg and also longer than the patella and tibia of 4th.

*Eyes* (text-fig. 21, B) of posterior line slightly recurved, widely separated, the laterals a little further from the medians than the medians are from each other; medians considerably smaller than laterals, about four diameters apart and about five diameters from the laterals; laterals on each side subequal, about a diameter apart; anterior median eyes barely a diameter apart, at least three diameters from the anterior laterals; ocular quadrangle about one-third wider behind than in front, the anterior median eyes a little nearer to each other than either is to the corresponding lateral; distance between anterior and posterior median about one-third of the distance between anterior median and anterior lateral, and one-fourth of that between posterior median and posterior lateral.

*Mandibles* (text-fig. 21, A) normal in size and direction; fang-groove armed behind with two teeth, the distal much the largest, the proximal separated from it by a space which is equal to about four times its own length; anterior border of fang-groove armed with 6-7 teeth, the distal near the base of the fang opposite the interval between the two teeth of the posterior row, the remaining 5 or 6 remote from it, evenly spaced, the distal of the series rising well behind the proximal tooth of the posterior row.

*Legs*: 1st pair unspined, 2nd leg with three inferior protarsal spines, one apical and two submedian; tibia of 3rd and 4th with a pair of inferior apical spines; protarsi with two or three spines at the base of the scopula and three at the apex, one median and one on each side; tarsi also with a few spiniform bristles intermixed with the normal bristles.

*Vulva* (text-fig. 21, C) as in the other species, consisting of a horny plate impressed with a heart-shaped pit which is wider than long, marked posteriorly by a low median crest and bordered by an upstanding edge which is posteriorly produced into an angular process with rounded apex, and armed on each side with a slender pointed process directed downwards and backwards.

Measurements in mm.—Total length 11, carapace 5; 1st leg 18, 2nd leg 13, 3rd leg 10.5, 4th leg 13.

*Loc.* Australia: San Remo, Westernport Bay in Victoria (*Miss Kenyon*).

Perhaps belonging to this species were the specimens recorded from Port Jackson by Mr. Whitelegge, J. R. Soc. N.S.W. xviii. pp. 162-323 (*cf. supra*, p. 101).

Concerning the habits of this spider, Miss Kenyon, to whom I have great pleasure in dedicating the species, writes:—"During a recent stay at San Remo, while turning over stones at low-water in search of Mollusca, I noticed what seemed to be the sea-worn shell of a *Crepidula*. Upon detaching the shell from the partially submerged rock to which it adhered, I found underneath it the spider with its legs drawn backwards and its head concealed under a sheet of web which exactly resembled the septum of the valve of a *Crepidula*, although the shell itself was that of an *Anomia*. The spider was conspicuous from the intense

blue of its abdomen and the vivid red of its cephalothorax. The shell was apparently fixed to the ground by means of a silken attachment, since the shell had to be removed by the insertion of the point of a penknife."

#### 6. *DESIS FORMIDABILIS* O. P. Cambridge.

*Robsonia formidabilis* O. P. Cambridge, Proc. Zool. Soc. 1890, p. 625, pl. liii. fig. 5.

*Paradesis formidabilis* Pocock, Bull. Liverpool Mus. i. p. 77 (1898).

S. Africa.

Habits unrecorded. No specimen in British Museum.

Unfortunately the arrangement of the teeth on the mandible in this species is neither figured nor described. The alleged absence of spines from the legs compels the conclusion that this species is distinct from the following *D. tubicola*. In the subjoined table of species, having no other characters to lay hold of, I have had no choice but to use this absence of spines in contrasting the two forms—an arrangement which unfortunately suggests that the relationship between the two South African species is less than that between one of the latter and the Australian species *D. kenyonæ*. On *à priori* grounds this is hardly likely to be the case.

#### 7. *DESIS TUBICOLA* (Pocock).

*Paradesis tubicola* Pocock, Bull. Liverpool Mus. i. pp. 76–77, figs. 1–3 (1898).

Loc. S. Africa; Wynberg in Cape Colony (*N. Abraham*).

Mr. Nendick Abraham's account of the habits of this spider is reprinted from the 'Bulletin of the Liverpool Museum.' After describing his first discovery of the animal in the tube-masses of *Tubicola*, the writer proceeds:—"This formation [the *Tubicola*-masses] is invariably covered by the sea at high tide, and much of it even at low tide . . . . Sometimes I have found five or six spiders in one piece of material weighing five or six pounds. Now, what is curious is that these spiders cannot swim or dive, and when placed on the surface of the water appear to be quite helpless, or nearly so . . . . I eventually succeeded in securing several nearly perfect examples [of their dwellings]. I then saw that the spider does not, as a rule, make its home in the empty tubes of the worms, but . . . . in the spaces left between the tubes." The dwelling consists of a delicate silken chamber with the opening seaward. "It is so frail and delicate that the least rough handling" destroys it. "Yet in this frail home of silk, hidden away in some little space in the mass of tubes built by marine worms, these spiders live and thrive, . . . . the waves breaking over them all day long . . . . I have watched the tubes when the tide was low in the hope of seeing a spider crawling or running about, but I have never yet seen one. They live out of



sight deep down amongst the worm-tubes. How they catch their food, what their food is, and how they keep the sea from drowning them, are questions I have not yet demonstrated, though I have tried again and again to keep them in my marine aquaria. Shortly after introducing one, I have often found it floating helplessly on the water, apparently half dead, and I have had it lifted out of the water and placed on the rockwork, when it soon became active and ran about very quickly, when it appeared to be just like an ordinary spider."

The characters of the species of the genus *Desis* may be tabulated as follows:—

- a. Eyes of posterior line subequally spaced; tibia and protarsus of posterior legs strongly spined.
  - a<sup>1</sup>. Eyes of posterior line closer together, the medians about two diameters from each other and from the laterals.
  - a<sup>2</sup>. The two teeth on the posterior border of the fang-groove close together, the distal much larger and closer to the proximal than to the base of the fang (according to Simon) ..... *maxillosa*.
  - b<sup>2</sup>. The two teeth on the posterior border of the fang-groove wide apart, the distal not larger than the proximal and equidistant from it and from the base of the fang (according to Koch) ..... *vorax*.
  - b<sup>1</sup>. Eyes of posterior line farther apart, the medians about three diameters from each other and from the laterals.
    - a<sup>3</sup>. Teeth on posterior border of fang-groove relatively close together, separated only by a space a little exceeding the length of the proximal, the two relatively subequal; teeth of anterior row starting nearer base of fang ..... *martensi*.
    - b<sup>3</sup>. Teeth of posterior border of fang-groove far apart, separated by a space equalling about three times the length of the proximal, the distal tooth much the larger of the two; teeth of anterior row starting farther from base of fang ..... *marina*.
- b. Eyes of anterior and posterior lines very unequally spaced, the distance between the medians and the laterals far greater than that between the medians; posterior legs weakly spined or unspined.
  - a<sup>4</sup>. Posterior legs without spines (according to Cambridge) ... *formidabilis*.
  - b<sup>4</sup>. Posterior legs with tibial and protarsal spines.
    - a<sup>5</sup>. Distal tooth on anterior margin of fang-groove remote from the base of the fang and close to the rest of the series; protarsus of 2nd, 3rd, and 4th legs spined only at apex; no median crest on floor of cavity of vulva, and the lateral processes shorter and projecting inwards more at right angles ..... *tubicola*.
    - b<sup>5</sup>. Distal tooth on anterior margin of fang-groove nearer to base of fang and remote from the rest of the series; protarsus of 2nd, 3rd, and 4th legs with a pair of spines on the proximal side of the scopula as well as at apex; vulva with median crest on floor of cavity, and lateral processes projecting obliquely backwards ..... *kenyonæ*.

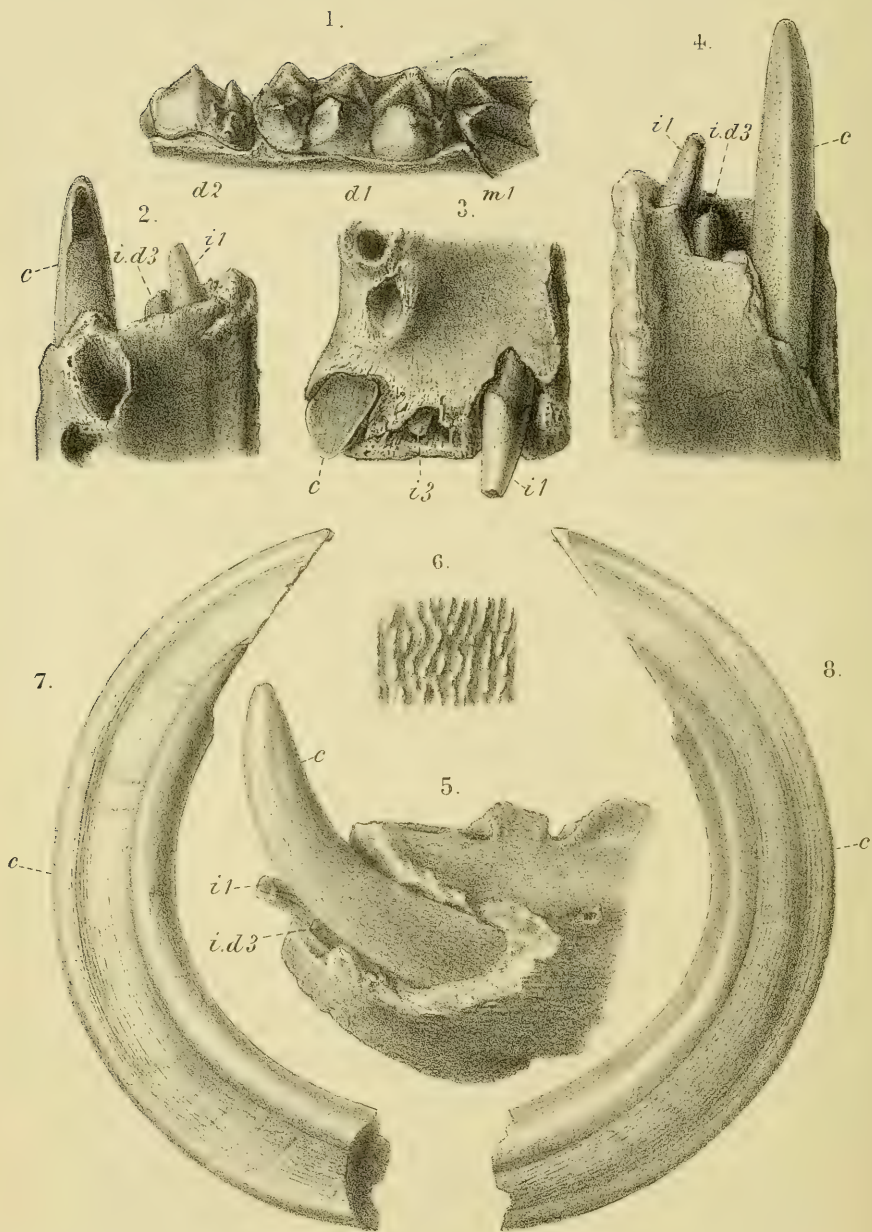
The discovery that a close specific relationship obtains between the South African and South Australian species is of the highest interest from a geographical standpoint, as favouring the hypothesis of a direct land connection, accompanied by temperate conditions, between these two continents. All the evidence that



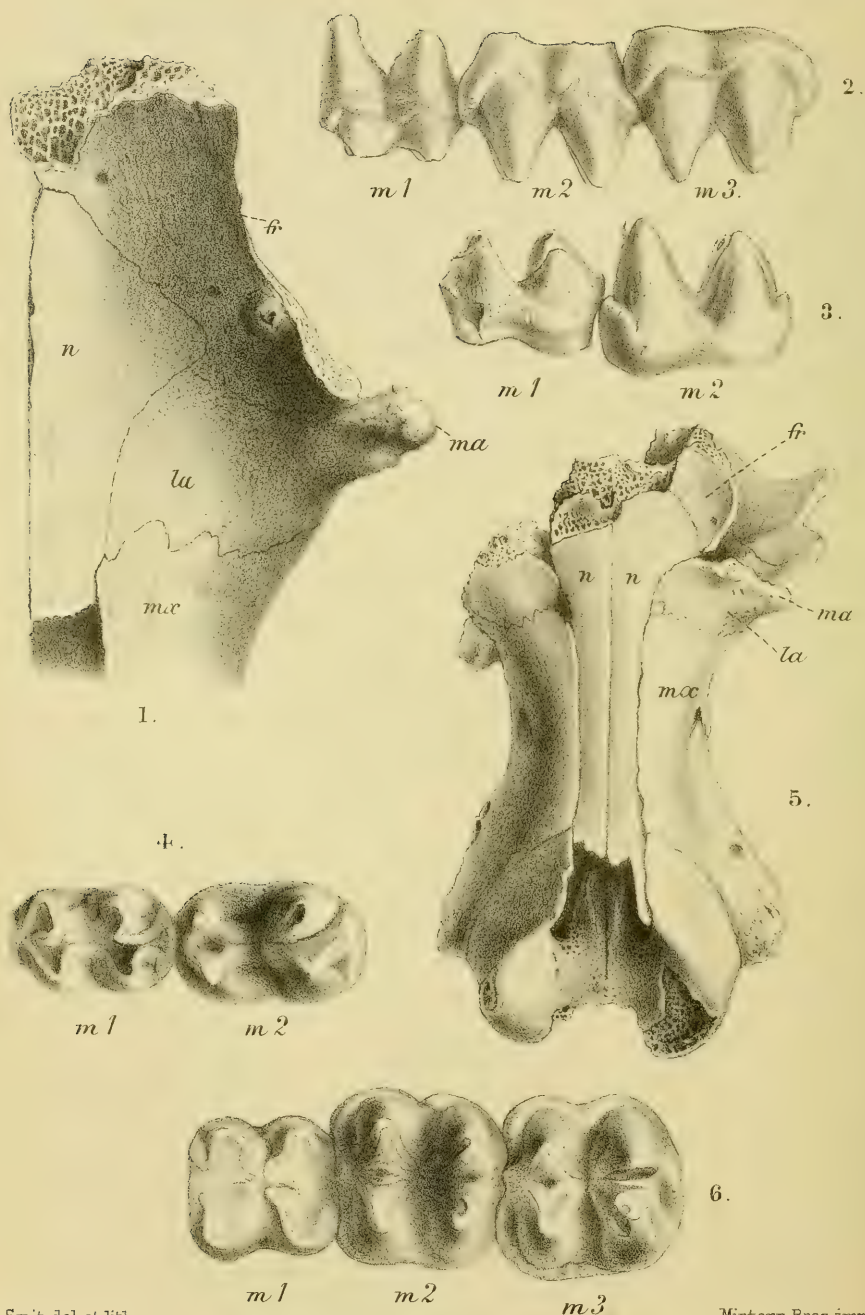
we possess as to the habits of these sea-spiders shows that they live between tide-marks on the shore; and that although gifted with considerable activity on land, they are quite unable to swim and are indeed practically helpless in the water. Hence their presence in S. Africa and S. Australia may be used as testimony to the former extension between these countries, either of a coast-line with shallow water, or at least of a submerged bank, partially exposed at low tide.

It may of course be urged by those who oppose the theory of the former existence of an Antarctic tract connecting the southern continents, that the species of this group of Spiders have reached the coasts of Cape Colony, New Zealand, and Australia by migration in a south-easterly and south-westerly direction from the coasts that border the Indian Ocean on the north. This hypothesis, however, affords no explanation of the fact that no spiders of this genus have been recorded from any spot along the miles of coast-line that intervene between, say, Durban and Singapore. Nevertheless I was myself disposed to adopt the hypothesis of a southward migration to account for the presence of these animals on the coasts of the continents which separate the Indian from the Atlantic and Pacific Oceans, until the example of *D. kenyonæ* came to hand, to testify to the very close affinity between the S. African and Australian types. If the hypothesis of migration from the north be the sole explanation of the distribution of the genus *Desis*, we should expect to find the annectant form between the two types of structure exemplified by, say, *D. formidabilis* from S. Africa and *D. marina* from New Zealand, not in the south, but in the north. As a matter of fact it has turned up in the south, and the most northerly known species, namely *D. martensi* from Singapore, is no nearer to the South African type than is the species that occurs in New Zealand. In my opinion, therefore, the theory of a transoceanic land-connection supplies the most satisfactory explanation of the affinity between the Australian and South African species. Clearly, however, this theory does not necessarily exclude the other entirely. The group may have come down from the north in the first place, and subsequently crossed, either from S. Africa to Australia, or the other way about; but until further light is thrown on the subject by the discovery of species along the western and northern shores of the Indian Ocean, I venture to think the available evidence bearing on the question favours the view that the group originated in the Austro-Malayan Islands and spread westwards from South Australia to S. Africa, along a coast-line connecting the two continents with one another.











5. On the Pigmy Hippopotamus from the Pleistocene of Cyprus. By C. I. FORSYTH MAJOR, F.Z.S.

[Received May 13, 1902.]

(Plates IX. & X.<sup>1</sup>)

The present paper deals with some selected specimens from a collection of bones of a pigmy Hippopotamus taken from caves and ossiferous breccias in Cyprus. It gives me great pleasure to announce that this exceedingly interesting first indication of a Pleistocene Mammalian fauna on the island is entirely due to the untiring energy of a young English lady, Miss Dorothy M. A. Bate, who started last year for Cyprus with the express purpose of discovering and exploring ossiferous caves.

Miss Bate is not a novice in cave-hunting. About two years ago, when residing in the Wye valley, she heard of bones having been found in a cave which had been more or less dug up by miners in search of iron-ore. The Natural History Museum owes to her an interesting collection of Pleistocene small mammals from this cave, of which she has published an account in the 'Geological Magazine'<sup>2</sup>.

Although Cyprus has been now for over twenty years under British administration, no attempt had been made to investigate the extinct Mammalian fauna of this, the third largest of the Mediterranean islands. But, from what I shall have to say hereafter, it would appear that some scanty remains of a pigmy Hippopotamus of this very same species have been for over one hundred years in certain French museums, and were believed to have come from some locality in the south of France, whereas there are strong grounds for the presumption that they were also in reality from Cyprus.

The first samples addressed to me by Miss Bate several months ago consisted in some much-worn teeth about the size of a pig's molars, which showed no indication of the trefoil pattern so characteristic of the *Hippopotamus* molars. A second small parcel contained a few less-worn teeth, together with a tooth's germ, from which it became at once evident that we had to do with a mammal of the Hippopotamus tribe, about half the size of a middle-sized *H. amphibius*, and the molars of which exhibited a modification of the common *Hippopotamus* pattern, approximating them to a less specialized type of Artiodactyle teeth. The well-known pattern of four trefoils is produced in the *Hippopotamus* molars by crests emanating in a longitudinal direction from the anterior and posterior side of each of the four principal cusps or pyramids, thus obstructing in part the transverse valley between them. In the molars from Cyprus the crests and the grooves separating the former from the cusps are much less developed,

<sup>1</sup> For explanation of the Plates, see p. 112.

<sup>2</sup> Geol. Mag. (4) viii. pp. 101-106 (1901).

with the result that on the worn crown-surfaces triangular and oval-shaped patterns replace the trefoils of the ordinary type (Pl. IX. fig. 1; Pl. X. figs. 2, 3, 4, 6). Another consequence of the lesser development of the longitudinal crests in the fossil teeth is the greater depth and width of the transverse valley and the space between tooth and tooth; thus allowing the cusps of the molars in the opposite jaw to insert themselves in the interstices, so that during mastication the jaws are forced to move in a lateral direction. In *Hippopotamus* proper the crowns are very soon flattened by the longitudinal movement of the jaws. This different mode of wear tends to increase the different appearance of the two kinds of molars; moderately worn teeth of the Cyprus fossil are almost lophodont.

The lower *canines* are not grooved as usually in *Hippopotamus*, but almost smooth, showing only a minute longitudinal striation (Pl. IX. figs. 4, 5, 7, 8); the same may be said of the *incisors* (Pl. IX. fig. 4). From what I have been able to ascertain, there were four lower incisors, at least in the specimens examined.

Some incomplete skulls are among the remains. In one of them (Pl. X. fig. 5) the lacrymal region is preserved, showing that, unlike what is to be found in *H. liberiensis* and *H. sivalensis*, the lacrymal is broadly interposed between the frontal and the maxillary, and an intercalary bone is present at the antero-internal angle of the lacrymal, as is frequently the case in the subfossil Madagascar *Hippopotami*, and not rarely also in the young of *H. amphibius*<sup>1</sup>.

It was natural to compare the fossil from Cyprus in the first place with the Pleistocene small-sized *Hippopotami* found in other Mediterranean islands. In Malta caves two species have been found; the larger of the two, *Hippopotamus pentlandi*, which is very abundant in Sicilian caves as well, is not much smaller than *H. amphibius*. The second one, which goes under the name of *H. minutus*, is a much smaller species, but still about one-fifth larger than the Cyprus form. Both the Maltese species show agreement with *H. amphibius* in the trefoil pattern of the molars, and therefore differ from the Cyprus species.

In the Lower Pliocene lignites of Casino (Tuscany) scanty remains of a *Hippopotamus* occur<sup>2</sup>, which agrees with the Cyprus form in the more generalized character of the molars<sup>3</sup> and in the smoothness of the lower canine's enamel coating. A molar presenting almost the same size was shown to me by Dr. Andrews; it was obtained from Wadi Natrun in Egypt; the *Hippopotamus* as well as the associated mammalian remains show that Wadi Natrun is about the same age as the lignites of Casino, viz. Lower Pliocene. A description of these remains will shortly be given by

<sup>1</sup> See on these topics my observations in Proc. Zool. Soc. 1896, pp. 976-978; as well as in the 'Geological Magazine,' (4) ix. pp. 194-197 (1902).

<sup>2</sup> D. Pantanelli, "Sugli strati Miocenici del Casino (Siena)," Mem. R. Accad. Lincei, (3) vol. iii. p. 12, pl. iv. figs. 1-7 (1879).

<sup>3</sup> H. G. Stehlin, "Ueber d. Geschichte des Suiden-Gebisses," Abhandl. Schweiz. Paläont. Ges. vol. xxvii. pp. 434, 435 (1900).

Dr. Andrews. The Italian and Egyptian Hippopotamus is of superior size to the Cypriot, and the Casino fossil has been shown to be hexoprotodont.

Perfect agreement in shape as well as in size with the Cyprus creature is presented by Cuvier's "petit Hippopotame fossile" (*H. minutus* Blainv.), as results from the all but forgotten description of it in the 'Ossements Fossiles'<sup>1</sup> and from Blainville's plate vi.<sup>2</sup> The first mention occurs in the "Programme" of the 'Ossements Fossiles'<sup>3</sup>, and runs as follows:—"Une espèce d'hippopotame, qui ressemble en miniature à l'hippopotame vivant, mais qui ne surpasse pas la grandeur du cochon. J'en ai découvert les os dans un grès siliceux dont j'ignore le pays." Cuvier had come upon this fossil in the basements of the Paris Museum, without any label to record its origin; some identical remains, likewise of unknown origin, he afterwards received from a private collection in Bordeaux, and from the Cabinet d'Histoire naturelle of a Monsieur Decken in Brussels<sup>4</sup>.

To-day, after almost a hundred years, it would be difficult to improve upon Cuvier's description of the few remains, some of which he himself had developed from a lump of ossiferous breccia, in which the bones were cemented by a scanty matrix, a "grès à base calcaire," as stated in the 'Ossements Fossiles.' Blainville, who attempted to improve upon and to criticize Cuvier's description, utterly failed, as he generally did in his invidious attempts to criticize his great predecessor's work.

The only point in which the more copious material before me seems to differ from Cuvier's description is in the interpretation he gives of the difference between the fossil teeth and those of *H. amphibius*, and which he assigns solely to the different mode of wear. As stated before, they are different from the very beginning; cause and effect must not be confused; an oblique wear is resorted to in the fossil teeth because their different conformation calls for it.

As to the locality of the fossils described by Cuvier, it was stated, many years after their first description, that, according to old catalogues of M. Journu-Aubert's private collection in Bordeaux, they had been found ("recueillis") somewhere between Dax and Tartas (Département des Landes) and came into the possession of one Président de Borda, from whom they passed into the private collection of a Monsieur Graves. After the latter's death they became the property of M. Journu-Aubert, who gave one of the blocks to Cuvier<sup>5</sup>.

It has never been possible to identify this locality near Dax. In 1869 P. Gervais states<sup>6</sup> that he has failed to gather any new

<sup>1</sup> Ossements Fossiles, 2nd ed. i. pp. 322-331 (1821).

<sup>2</sup> Ostéographie, Genre Hippopotamus, pl. vi.

<sup>3</sup> Journal de Physique, de Chimie et d'Histoire Naturelle, tome lii. p. 263 (Germinal An 9, i. e. March & April, 1801).

<sup>4</sup> Oss. Foss. 4th ed. i. pp. 490, 491 (1834).

<sup>5</sup> *Tom. cit.* pp. 490, 491 (1834).

<sup>6</sup> Zool. et Pal. Gén., prem. sér. p. 250 (1867-69).

information about the locality of Cuvier's "petit Hippopotame fossile." From a statement made by Gaudry several years later, it appears that the writer entertained some doubts as to the alleged locality of the *H. minutus*: "M. Tournouier, qui a si bien exploré le Sud-Ouest de la France, m'a dit qu'il ne connaissait entre Dax et Tartas, au-dessous des sables des Landes, que la mollasse calcaire coquillière à *Ostrea crassissima*, dite *Mollasse marine de l'Armagnac* (Miocène moyen ou supérieur). On devrait donc supposer que les débris d'une espèce d'Hippopotame, c'est-à-dire d'un animal de rivière, ont été déposés dans la mer. Il paraît d'ailleurs que les Hippopotames vont quelquefois à la mer."<sup>1</sup>

In fact, this "*Mollasse marine de l'Armagnac*" is Tortonian<sup>2</sup>. Now it is quite inadmissible that the same mammalian species should occur in the Tortonian of France and in the Pleistocene of Cyprus. I am not aware that similar remains have since been found in France, nor in any other European locality. Therefore, considering the uncertainty prevailing as to the origin of these remains in French and Brussels Museums, whereas Cuvier's description of the matrix agrees with that adhering to many of Miss Bate's specimens, and especially considering the identity of the species, I do not hesitate to suggest that Cuvier's "petit Hippopotame fossile" may have been brought over from Cyprus.

The ossiferous breccia at Chrysostomo, near Kythrea (Hagia Marina) in the district of Nicosia, where Miss Bate obtained the bulk of her collection, was well known in former times. The Dutch painter and traveller, Corneille le Brun (de Bruyn), was made aware of its existence by the then French Consul at Larnaca, and he travelled to Kythrea "expressément afin d'aller voir un certain lieu situé dans la montagne, où l'on voit les os des hommes et des bêtes qui se sont incorporez à la roche, qui s'entretiennent et qui se sont pétrifiés."<sup>3</sup> From what he further on says, it appears that at that time (end of the seventeenth century) the Greek inhabitants worshipped the place, which they believed to contain the bones of some of their Saints. Le Brun detached some of the bones from the breccia; "le principal fut un os qui ressemble à celui du bras d'un homme, que les anatomistes appellent *radius*." This he took with him to Europe and figured it in his work (No. 193) in two pieces. From the figure it is very evident that the supposed human radius is the femur of the Hippopotamus represented from the posterior side, the larger fragment being the proximal, the smaller the distal portion.

There is a recent form also which claims relationship with the pigmy fossil Hippopotamus. Gervais, almost the only writer of more modern times, who in connection with the study of fossil

<sup>1</sup> Bull. Soc. Géol. de France, (3) iv. p. 504, footnote 1 (1876).

<sup>2</sup> De Lapparent, 'Traité de Géologie,' 4me éd. p. 1525 et seqq. (1900).

<sup>3</sup> Corneille le Brun, 'Voyage au Levant, c'est-à-dire dans les principaux endroits de l'Asie Mineure dans les isles de Chio, de Rhodes, de Chypre, etc.' Traduit du Flamand. Delft, 1700, p. 375.



Hippopotami has taken the trouble to look at Cuvier's description<sup>1</sup>, says that the shape of the lower incisors and canines of Cuvier's "petit Hippopotame fossile" and of the *Chœropsis liberiensis* from West Africa, which is of the same size, seem to leave no doubt that there is generic identity between both; he therefore proposes to call the fossil *Chœropsis minutus*<sup>2</sup>.

The molars of the Liberian form had previously been described by Gratiolet, who states that the trefoil pattern is in this species replaced either by crescents, or by triangles with slightly emarginated sides<sup>3</sup>. On comparison of the molars from Cyprus with those of the specimen of *H. liberiensis* in the Natural History Museum, I find that the trefoil pattern is more effaced in the former than in the latter. The almost unworn molar from Wadi Natrun agrees in this respect with the molars of *H. liberiensis*.

The shape of the molars therefore shows in *H. minutus* the most generalized condition of all the known forms; whereas the conformation of its skull, from the material at present available, appears to be more specialized than in *H. liberiensis* and *H. sivalensis*.

On the whole, so far as actually known, *Hippopotamus minutus* is an early type of the Hippopotamus tribe. Its diminutive size may be partly—as in *H. liberiensis*—a primitive feature, partly a consequence of its restricted habitat.

Like other Mediterranean islands<sup>4</sup>, Cyprus seems therefore to have preserved among its Pleistocene fauna little-modified survivors of Tertiary Mammalia.

From his investigation of the recent Molluscan fauna, Kobelt was led to consider Cyprus as an old island ("eine seit langer Zeit abgetrennte Insel"), showing traces of a former connection with the three neighbouring provinces (*i. e.* Asia Minor, Syria, and the region of the Archipelago), without, however, having received any new immigrants since the end of the Tertiary<sup>5</sup>.

In this order of ideas it is noteworthy that a Wild Sheep discovered on an island of the Urmi Lake (N.W. Persia) by Mr. Robert Günther has been shown by Dr. A. Günther to be nearly related to the *Ovis ophion* still lingering on the highest summits of Cyprus<sup>6</sup>.

<sup>1</sup> Falconer, Leith Adams, and others do not appear to have done so; else they would not have confused the small Hippopotamus from Malta with *H. minutus*.

<sup>2</sup> Zool. et Pal. Gén., prem. sér. p. 250 (1867-69).

<sup>3</sup> L. P. Gratiolet, 'Recherches sur l'Anatomie de l'Hippopotame,' pp. 227-233 (1867).

<sup>4</sup> See my latest contribution to this subject in the Proc. of this Society, Dec. 17, 1901, pp. 625-628, "On *Enhydrietus galictoides*, from the Pleistocene Ossiferous Breccia of Sardinia."

<sup>5</sup> W. Kobelt, 'Studien zur Zoogeographie. II. Die Fauna der meridionalen Sub-Region,' pp. 337-339 (1898).

<sup>6</sup> A. Günther, "The Wild Sheep of the Urmi Islands," Journ. Linn. Soc., Zoology, vol. xxvii, pp. 374-376, pl. 22 (1899).



## EXPLANATION OF THE PLATES.

## PLATE IX.

Teeth of *Hippopotamus minutus* Blainv., from the Pleistocene of Cyprus. The originals of figs. 1-5 are from the Cave of Hagios Jannos, Cape Pyla (south coast); the canine figured, figs. 7 & 8, is from the ossiferous breccia of Chrysostomo, near Kythraa (district of Nicosia).—All figures of the natural size, except fig. 6.

Fig. 1. Fragment of the right mandibular ramus of very young specimen, showing the two posterior deciduous molars (d 1, d 2) scarcely worn, and behind them the anterior portion of the first true molar (m 1), which has not yet completely protruded.

2. Anterior portion of the left mandibular ramus of another very young individual, upper view—exhibiting the canine (c); the much-worn outer deciduous incisor (id 3), without any trace of enamel coating left; and the inner permanent incisor (i 1), which has not yet completely protruded.

3. Anterior portion of the right mandibular ramus of an individual slightly older than the preceding. Upper view. The canine (c), broken at the level of the alveolus, exhibits an almost horizontal section. The outer permanent incisor (i 3) has not yet cut the gum; the inner incisor (i 1) is more advanced.

4. Same specimen as fig. 2; lower view.

5. The same; outer view.

6. Much enlarged view from a portion of the outer enamel coating of the lower canine (fig. 5) near its base; to show the enamel sculpturing.

Figs. 7 & 8. Middle-sized lower canine, probably ♀; right side. Fig. 7, inner; fig. 8, outer view.—The dimensions in millimetres are:—

Length, following the posterior curvature .....	132
Width of inner side .....	16.5
"      " outer side .....	12

The largest canine of the collection presents the following dimensions as above:—195—24—18.

## PLATE X.

Portions of skull and molar teeth of *Hippopotamus minutus* Blainv., from the Pleistocene of Cyprus. Figs. 1-4 & 6, nat. size; fig. 5,  $\frac{1}{2}$  nat. size.—All the figures have been reversed on the Plate.

Fig. 1. Lacrymal region of an incomplete skull; right side. *fr.*=frontal, *n.*=nasal, *la.*=lacrymal, *mx.*=maxillary, *ma.*=malar. Cave Dikomo Mandra, near Nicosia.

2. Right upper true molars of skull, fig. 1; outer view.

Figs. 3 & 4. First and second lower true molars; right side. Fig. 3, outer view; fig. 4, upper view. Chrysostomo.

Fig. 5. Upper view of incomplete skull, from the Cave of Hagios Jannos, Cape Pyla.

Fig. 6. The same as fig. 2; lower view.

6. On some new and little-known Butterflies of the Family *Lycænidæ* from the African, Australian, and Oriental Regions. By HAMILTON H. DRUCE, F.Z.S., F.E.S.

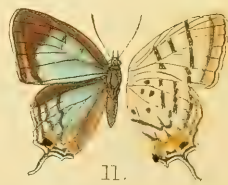
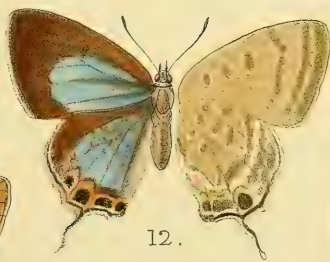
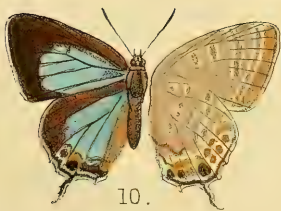
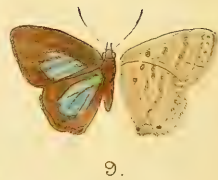
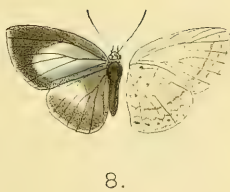
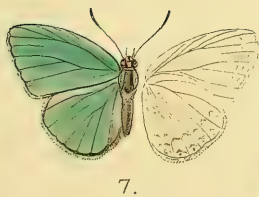
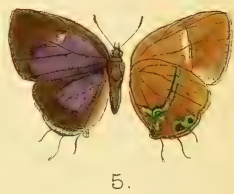
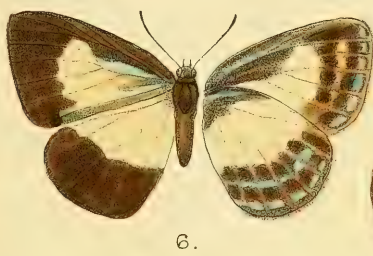
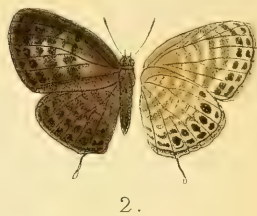
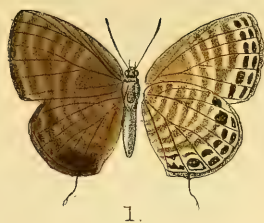
[Received May 14, 1902.]

(Plates XI. & XII.<sup>1</sup>)

The following notes and descriptions are suggested by the study of some specimens of *Lycænidæ* in our own collection, and of some in the Hope Museum at Oxford.

The types of the Australian species described by Herr Semper, and which are now in our possession, have been carefully com-

<sup>1</sup> For explanation of the Plates, see p. 121.



W. Purkiss del. et lith.

Mintern Bros. imp.

NEW OR LITTLE-KNOWN BUTTERFLIES  
OF THE FAMILY LYCÆNIDÆ.





W.Purkiss del. et lith.

Mintern Bros. imp.

NEW OR LITTLE-KNOWN BUTTERFLIES  
OF THE FAMILY LYCÆNIDÆ.





pared, and as they appear to be quite unknown to Australian Lepidopterists, I hope these notes will be found useful.

I am also able to exhibit specimens of several fine species of African *Iolai* which have hitherto been known from descriptions only.

*HYPOCHRYSOPS REX* Bd., var. *BRUNNEA*, nov.

The female of this form differs considerably from that sex of typical *H. rex* by the white area on the fore wing above being much reduced in size and scarcely extending into the middle of the cell. The male does not differ from *H. rex* ♂.

*Hab.* Ferguson Is. (*A. S. Meek*; Mus. Druce).

I believe that *H. epicletus* Felder, which at one time (Trans. Ent. Soc. 1891) I thought could be separated from *H. rex*, must be sunk as a synonym of that species, as we possess several specimens from Aru, collected by Captain Cayley Webster, which are identical with specimens from New Guinea.

We have lately received a female of *H. rovena* mihi from Cooktown, in which the blue suffusion extends all round the white patch on the fore wing above.

*TALICADA NYSEUS* Guér., var. *KHASIA*.

This form, which appears to only inhabit the Jaintia and Khasia Hills, is distinguished from the Southern and Western Indian forms by the much larger black spots on the hind wing below, and by the black outer marginal border (containing the row of white lunules) on the fore wing being much narrower, consequently the white area between it and the inner black band is much more extensive. There is almost invariably an elongated black spot on the costa over the middle of the cell. This black spot never occurs in any Southern or Western specimens. The red on the hind wing above is more in the nature of a band in the form *khasia* than in typical *nyseus*. Mr. Moore has figured the Southern form, whilst de Nicéville gives an excellent figure of the Northern insect (Butt. Ind. iii. pl. xxvi. fig. 179). Guérin's figure of his type from Pondicherry shows more white between the black bands on the fore wing below than in any specimens I have come across from S. or W. India, but we possess one from Ganjam agreeing exactly. I have examined a considerable number of specimens, but although the two forms vary slightly *inter se* they can be at once distinguished.

Staudinger's figure, which is said to represent an African specimen, is much like those from S. India. It is, however, without a tail, and has been named *T. ecaudata* by Dr. Butler (Ann. & Mag. N. H. ser. 7, vol. v. p. 61, 1900). The orange patch appears to me to be of much the same tint as in Indian specimens.

*NACADUBA ATROMARGINATA*, sp. n. (Plate XI. figs. 1, 2.)

♂. Allied to *N. angusta* Druce, from which it differs on the upperside by the outer margins of both wings being distinctly

black-bordered, and by the anal region of the hind wing being strongly suffused with black.

On the underside, the ground-colour is darker and yellower and the bands are more distinct. The two submarginal rows of black spots on each wing are larger and blacker.

♀. Upperside uniform dark brown, with the markings of the underside showing through, slightly whitish in the centre of the disc of the fore wing, and with two or three dull black spots at the anal angle of the hind wing, outwardly margined by a fine white line. When held at an angle, the disc of the fore wing appears slightly suffused with bright blue scales from the base. Underside as in male.

Abdomen brown above; yellowish below. Legs and antennæ spotted with white.

Expanse, ♂  $1\frac{1}{2}$ ; ♀  $1\frac{3}{10}$  inch.

*Hab.* S. Celebes (*Doherty*); Tombugu, E. Celebes (*Kuhn*) (*Mus. Druce*).

This appears to be the insect figured by Herr Semper (*Reise Philipp. Inseln*, p. 177, pl. xxxiii. figs. 1, 2) as *N. azureus* Rober, but a reference to Herr Rober's figure shows an insect with a linear black margin only.

*UNA PURPUREA*, sp. n. (Plate XI. fig. 3.)

♂. Upperside dull blackish purple, with the outer margins of both wings narrowly and indistinctly black, broadest towards anal angle of hind wings. Underside: fore wing dull greyish brown, yellowish along the costal area; a whitish blotch beyond and closing the end of the cell, followed by another about half-way between it and the outer margin.

Hind wing: basal half pale straw-colour, without markings; outer half russet-brown, with a submarginal row of 4 or 5 dull indistinct blackish spots between the nervules, the largest being between the lower medians—these spots being surmounted by dull straw-colour spaces.

The margins of both wings are very narrowly yellowish between the nervules, and the fringes are dark brown.

Head, thorax, and abdomen blackish above, yellowish below. Antennæ spotted with white.

Expanse 1 inch.

*Hab.* Lifu I., Loyalty Is. (*Mus. Druce*).

This species, which is tailless, appears to agree exactly in venation with *Una usta* Distant, and like that insect has rather long antennæ and the long hair-like scales about the anal angle of hind wing—this last character, however, is not so marked as in *U. usta*. The eyes are hairy as in that species. *Prosotas*<sup>1</sup> is probably a closely-allied genus, but the antennæ are much shorter.

*JAMIDES PHASELI* Mathew<sup>2</sup>.

This insect is placed by Mr. Miskin (Ann. Queensl. Museum,

<sup>1</sup> *Prosotas* H. H. Druce, P. Z. S. 1891, p. 366.

<sup>2</sup> *Lampides phaseli* Mathew, Trans. Ent. Soc. 1889, p. 311.

no. 1, 1891) in *Lycænesthes*, with a mark denoting that he did not know the species.

I have seen Mr. Mathew's type, which is in Mr. Godman's collection, and find that it belongs to the group of which *J. bochus* Cr. is the best known representative, but is a much duller insect. We have exactly similar specimens from Rockhampton.

WAIGEUM CERAMICUM, sp. n. (Plate XI. fig. 6.)

♀. Allied to *W. subcæruleum* Grose-Smith & Kirby<sup>1</sup>, from which it differs on the upper and under side by the white areas of both wings being much more extensive, and consequently by the brown borders being narrower. In addition to the blue scales shown in the figure of the upperside of *W. subcæruleum*, the lower half of the cell of the fore wing is thickly so dusted.

On the underside of the fore wing the costal and outer marginal blue lines are alone present, the blue submarginal band and the streak in the cell are wanting. The submarginal band is partially replaced by whitish. On the hind wing the ultramedian blue band is replaced by a narrow line, and the yellowish-brown marginal border is scarcely discernible.

Expanse 2 inches.

*Hab.* Ceram (Wallace; Hope Coll. Mus. Oxon.).

The type specimen, which is the only one I have seen, is also labelled "Coll. Wallace, Hewitson 1874," and was probably acquired from Hewitson by Professor Westwood as a duplicate.

PHILIRIS INNOTATUS Miskin.

*Pseudodipsas innotatus* Miskin, Ent. Mo. Mag. p. 165 (1874).

Mr. Miskin, in his Catalogue of the Butterflies of Australia (Annals Queensl. Museum, no. 1, 1891), sinks this name as a synonym of *P. ilias* Felder. I cannot, however, agree with him. We have a large series of *P. ilias* from Amboyna captured by Doherty, which do not vary, and which I have compared with Felder's type. *P. innotatus* has the apex of the fore wing and the outer margins of both wings more broadly black-margined. The shape of the fore wings is also quite different: in *P. innotatus* the inner margin is much shorter and the outer margin (which in *P. ilias* is convex) is much straighter, consequently the apex of the wing is very much more pointed.

We have a good series of *P. innotatus* from various parts of N. Australia, and I find that these characters are always present.

Mr. de Nicéville has lately (J. A. S. B. vol. xlviii. pt. ii. n. 2, p. 265, 1898) stated that *Philiris* Rober should be sunk under *Pseudodipsas* Feld., but with this conclusion I do not agree. Certainly the venation appears to be almost identical with that genus, as indeed it does with *Hypochrysops*; but the shape of the wings in the male is quite different, the hind wing being much more elongate towards the anal angle with its outer margin nearly straight. The antennæ also are much longer and more gradually and more extensively clavate.

<sup>1</sup> *W. subcæruleum* Grose-Smith & Kirby, Rhop. Exot. vol. ii.; Oriental Lycænidae, p. 35, pl. vii. figs. 4, 5 (1896).

*P. digglesi* Hew. appears to agree in these characters with the type of *Pseudodipsas*, viz. *P. eone* Feld. Two other species are included by Mr. Miskin (*loc. cit.* p. 67) in *Pseudodipsas*, but I have not seen these. Mr. de Nicéville (*loc. cit.*) appears to have confused *P. ilias* with *P. intensa* Butl. Mr. Miskin also states that he knows *Utica onycha* Hew. from the description and figures only. Probably he knows it well under another name, as it is quite a common species and we have many examples from various parts of Australia and New Guinea, which I have compared with the type in the British Museum. Hewitson's figure, which represents a female, is too highly coloured. *Theclinesstes eremicola* Pagenst. Zoologica, xxvii. p. 123, pl. ii. fig. 9 (1900), appears to be identical with Hewitson's *Utica onycha* and must be sunk as a synonym.

#### ARRHENOTHRIX PENICILLIGERA de Nicéville.

There appear to be two forms of this species from the Khasia Hills. The larger and typical form has the black apical border more extensive and the blue coloration darker in shade than the smaller form, which has the blue area on the fore wing extending partially up the outer margin from the angle. Large series of each form have been received, and these differences may possibly be seasonal.

#### TAJURIA THYIA de Nicév.<sup>1</sup>, var. PALLESCENS, nov.

♂. Upperside with the blue area much paler, more lavender, and more extensive than in typical *thyia*; in the fore wing extending upwards to the 2nd median nervule, and in the hind wing much closer to the costal margin. The underside is also paler, with the short marks at the ends of the cells clearly defined, and the black spots at the lobe and between the lower median nervules minute and very faintly surrounded with pale yellow.

*Hab.* Jaintia Hills (*Mus. Druce*).

This form, which may be seasonal, has been received in considerable numbers by Colonel Swinhoe, to whose generosity we are indebted for possessing it. We have typical *T. thyia* also from the Jaintia Hills.

#### PSEUDALMENUS, gen. nov.

Allied to *Ialmenus*, from which it differs by the costal margin being depressed about the middle, not arched as in that genus, and by the subcostal nervule reaching the margin below the apex of the wing (in *Ialmenus* it reaches the margin above the apex). The cell is shorter and broader, and in the hind wing the median nervule is longer with its branches more nearly equal in length, this being caused by the upper nervule being bent upwards more

<sup>1</sup> *Tajuria thyia* de Nicév. J. B. N. H. Soc. 1892, p. 336, pl. H. fig. 11, ♂.



than in *Ialmenus*. Palpi more robust and hairy and the terminal joint shorter. Eyes smooth.

Type, *Thecla myrsilus* Doubl. & Hew.

EPAMERA SAPPIRUS, sp. n. (Plate XII. fig. 1.)

♂. Upperside closely allied to *E. bellina*, but slightly darker blue, and the lower half of the lobe rather more distinctly white. The anal black quadrate spot is large and distinct.

On the underside this species is more nearly allied to *E. mermis* mihi, and like it has linear dark bands crossing the wings beyond the middle, but not so distinctly black as in that species. The line at the end of the cell in fore wing is almost obsolete. The reddish-orange anal patch is more extensive and reaches upwards to the black line and outwardly to the red spot between the lower median nervules.

Along the centre of this red patch runs a broad line of metallic scales, from the anal margin, zigzag to the red spot and downwards towards the lobe. The apex of the fore wing is slightly brownish. The tuft of hair on inner margin of fore wing below is black.

Frons white; body black above, buff-colour below. Legs white, with black spots. Antennæ black, with small white spots.

Expanse  $1\frac{1}{5}$ – $1\frac{3}{5}$  inch.

Hab. Sierra Leone; Addah (*Mus. Druce*).

We have long possessed a specimen of this insect which I thought was a variety of *E. bellina*, but the receipt of more specimens has convinced me it is distinct. *E. bellina* has no dark lines below.

I take this opportunity of exhibiting figures of several beautiful species of this group which have hitherto been known only from descriptions; they are as follows:—

*E. mermis* mihi (Pl. XII. fig. 2), Ann. & Mag. Nat. Hist. (6) xvii. p. 285 (1896).

*Argiolais silas*, var. *lalos* mihi (Pl. XII. figs. 3, 4), *tom. cit.* p. 286 (1896).

*A. lukabas* mihi (Pl. XII. fig. 5), Ann. & Mag. Nat. Hist. (6) v. p. 30 (1890).

*A. paneperrata* mihi (Pl. XII. fig. 7), *tom. cit.* p. 30 (1890).

*A. menas* mihi (Pl. XII. figs. 8, 9), *tom. cit.* p. 29 (1890).

*A. julius* Staud. (Pl. XII. fig. 6), Iris, iv. p. 146 (1891).

#### APHNIOLAUS, gen. nov.

Allied to *Epamera*, and like that genus possessing four subcostal nervules to the primaries in both sexes. Differing, however, by the inner margin of fore wing in ♂ being nearly straight, and by the total absence of secondary sexual characters.

Type, *Myrina pallene* Walleng.

This genus, which contains only one species, appears to connect the group of genera allied to *Iolais* with *Aphneus*.

Professor C. Aurivillius, in his 'Rhopalocera Æthiopica,' includes several structurally distinct groups under the genus



*Iolais*, and at the same time erects a new genus for *I. mermeros* Mabille.

I have lately been able to examine a specimen (♂) of *Iolais trimeni* Walleng., and find that it agrees in venation with *Epamera sidus* Trimen, and should be placed in the same genus.

*HORAGA AMETHYSTUS*, sp. n. (Plate XI. figs. 4, 5.)

♂. Upperside dull dark bluish purple, with a minute white spot at end of cell and sharply-defined dark brown margins.

Fore wing: costal very narrowly, outer margin rather broadly dark brown, broadest at apex. Hind wing: costal, outer, and anal margins dark-brown bordered, of about equal width to outer margin of fore wing. A white anteciliary line near the anal extending about halfway up the wing.

Underside rather pale greenish brown, inclined to a more orange shade towards anal regions of hind wing. Fore wing crossed just about the middle by a rather distinct white band, outwardly bordered by a dark brown line, commencing just below the costa and reaching nearly to the inner margin, which is paler.

Hind wing with a rather narrow, but distinct, pale metallic blue band, inwardly bordered by a dark brown line, crossing the wing about the middle from the costal margin to the lower median nervule, where it becomes broken into a number of short streaks and crescent-shaped markings, which are spread over the anal region and inwardly to the inner margin. A rather large black spot on the margin between the lower median nervules, crowned by a metallic blue crescent, and above this spot another minute black speck almost covered with metallic blue. A black spot on the lobe which is small. The marginal space below the submedian nervure is dusted with black and grey scales. An anteciliary black line followed by a narrow white line.

Cilia of fore wing brown; of hind wing brown, tipped with white towards anal angle.

Abdomen brown above, sordid white below; palpi white with black tips; legs white with black spots.

♀. Upperside violaceous blue, with a distinct white spot at the end of the cell, and broad dull brown margins; on the hind wing the blue area scarcely extends beyond the cell.

Underside as in male, but ground-colour paler.

Expanse, ♂ 1 inch, ♀  $1\frac{1}{2}$  inch.

*Hab.* British N. Borneo (*W. B. Pryer*).

(Type, ♂ Mus. Druce; ♀ in coll. Hope, Mus. Oxon.)

We have long possessed the male of this apparently very distinct species; it was formerly in Herr Semper's collection, and Professor Poulton has sent me the female for examination.

Herr Frühstoffer (Berlin. ent. Zeit. 1897, 1898) has described several new species of this genus and given lists of those already known, but I can find nothing amongst them that will agree with the one here described.

We have in our possession the types of the various species of *Lycenidæ* described by Herr Geo. Semper in the 'Journal des Muséum Godeffroy,' xiv. pp. 154-168 (1878). Many of these are very little known, and I propose to review them here and to give figures of some which are of interest. I take them in the order in which they were published, viz. :—

*Danis macleayi*, p. 155.

*Lampides dubiosa*, p. 159.

*Holochila marginata*, p. 161.

„ *helenita*, p. 162.

„ *hyacinthina*, p. 162.

„ *anita*, p. 163.

*Ialmenus dämeli*, p. 167.

The types of two others described, viz. :

*Lycæna sylvicola*, p. 159,

*Lycænesthes godeffroyi*, p. 165

are in the Godeffroy Museum. I do not know them.

#### THYSONOTIS MACLEAYI.

*Danis macleayi* Semper, Mus. Godeffr., Lep. xiv. p. 155.

Easily distinguished from *T. taygetus* Feld. by the paler blue in the male, and by the chequered cilia in both sexes.

#### NACADUBA DUBIOSA Semper.

*Lampides dubiosa* Semper, Mus. Godeffr., Lep. xiv. p. 159 (1878).

The type of this species consists of the four wings only, the other parts of the insect having been lost. These wings are, however, quite perfect enough to enable it to be determined. It is at once distinguished from *N. berenice* Herr.-Schäff. by the ultramedian band on the fore wing below being more continuous, *i. e.* the lower half not being placed further inwards than the upper half.

It has no tail as in *N. berenice*.

#### CANDALIDES MARGARITA Semper.

*Holochila margarita* Semp. Mus. Godeffr., Lep. xiv. p. 161 (1878).

This species is very close to *C. absimilis* Feld. ; indeed, the only difference I can detect is the shade of blue on the upperside, which is considerably greyer. This of course may only be seasonal.

#### CANDALIDES HELENITA Semper. (Plate XI. figs. 7, 8.)

*Holochila helenita* Semp. Mus. Godeffr., Lep. xiv. p. 162 (1878).

I exhibit figures of the type ♂ and ♀ of this species, and an examination of them will show that the ♀ is rather more strongly marked below than the ♂, but that the markings are traceable in the latter sex. *H. (=C.) androdus* Miskin, P. L. S. N.S.W. ser. 2, v. p. 41 (1890), appears to be very closely allied, if indeed it is distinct. Mr. Miskin does not, however, mention the darker and differently placed scales which appear to be on the median nervules of the fore wing of the type ♂.

## CANDALIDES ERINUS Fabr.

*Papilio erinus* Fabr. Syst. Ent. p. 525 (1775).

*Holochila hyacinthina* Semp. Mus. Godeffr., Lep. xiv. p. 163 (1878).

The types show that Herr Semper has redescribed the large form, having identified the form named *subpallidus* by Dr. Lucas as *C. erinus* Fabr., as specimens formerly in his possession prove.

## CANDALIDES ANITA Semper.

*Holochila anita* Semp. Mus. Godeffr., Lep. xiv. p. 163 (1878).

*Lycena mœrens* Rosen. Ann. & Mag. N. H. ser. 5, xvi. p. 377 (1885).

Herr Semper's type is in a very bad state of preservation, but a careful examination has proved that it is identical with the type of *L. mœrens* in the British Museum. Mr. Miskin, in Ann. Queensland Museum, no. 1, p. 65 (1891), places this and the preceding species referred to under *H. erinus*, but I find it impossible to agree with him. They are differently coloured and marked, and have different shaped wings.

## IALMENUS DÄMELI. (Plate XI. figs. 10, 12.)

*Ialmenus dämeli* Semp. Mus. Godeffr., Lep. xiv. p. 166 (1878).

*Ialmenus illidgei* Lucas, P. R. S. Soc. Qd. p. 156, figs. 1, 2 (1889).

I quite agree with Mr. O. B. Lower that the insect described by Dr. T. P. Lucas is identical with Herr Semper's species. The type specimens, which are in fine condition, are exhibited. *I. dämeli* is at once distinguished from *I. ictenus* Hew. by the black linear bands below being replaced by broader buff-coloured bands of a slightly darker shade than the ground-colour. I also exhibit (Pl. XI. fig. 11) a specimen of *I. eichorni* Staud. Exot. Schmiett. p. 275 (1888), received from the late Dr. Staudinger under that name from Cooktown. It appears to be quite distinct. *I. itonus* Miskin, P. L. S. N.S.W. ser. 2, v. p. 41 (1890), seems from the description to be identical with this species.

In a footnote<sup>1</sup> will be found described a species of *Ialmenus* which I believe to be quite distinct.

<sup>1</sup> IALMENUS CLEMENTI. (Plate XI. fig. 9.)

♂. Allied to *I. inous* Hew. Much smaller. Upperside pale greyish brown, with the blue suffusion less extensive, more brassy, and not reaching into the cell of the fore wing. The anal margin of hind wing is nearly straight and not dentate as in *I. inous*. The black spot on the margin between the nervules is small, circular and distinct, and surrounded by very pale yellow. Underside paler than in *I. inous*, and the bands composed of sordid white, ringed, chain-like markings arranged much as in that species, but less distinct.

♀. As ♂ but paler, and brassy blue suffusion even less extensive in fore wing above.

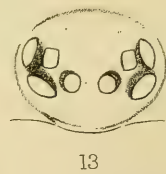
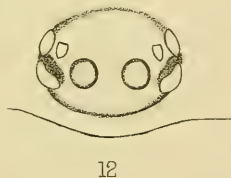
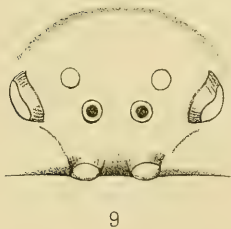
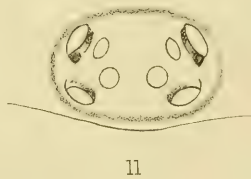
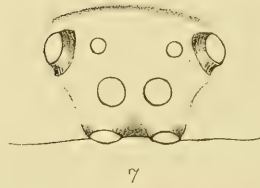
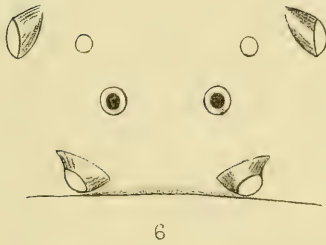
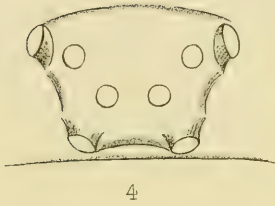
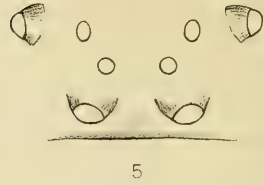
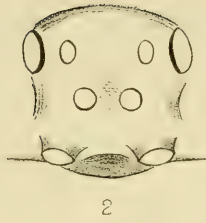
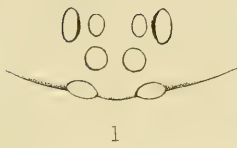
Expanse, ♂ 1-1 $\frac{1}{10}$  inch, ♀ 1 $\frac{1}{2}$  inch.

Hab. W. Australia, Touranna Plains, between Yule River and Sherlock River, Jan. to May (*E. Clement, Ph.D.*).

Four specimens, three of which, including the types, are in the Hope Museum, Oxford, and one in our own, kindly presented by Professor Poulton, F.R.S.

This is the smallest species of the genus described.





H.R. Hogg del. F.P.C. lith.

12

West, Newman imp.

Eyes of Spiders of the sub-order Mygalomorphæ.



## EXPLANATION OF THE PLATES.

## PLATE XI.

- Fig. 1. *Nacaduba atromarginata*, ♂, p. 113.  
 2. " " " ♀, p. 114.  
 3. *Una purpurea*, ♂, p. 114.  
 4. *Horaga amethystus*, ♂, p. 118.  
 5. " " " ♀, p. 118.  
 6. *Waigeum ceramicum*, ♀, p. 115.  
 7. *Candalides helenita*, ♂, p. 119.  
 8. " " " ♀, p. 119.  
 9. *Ialmenus clementi*, ♂, p. 120.  
 10. " *dämeli*, ♂, p. 120.  
 11. " *eichorni*, p. 120.  
 12. " *dämeli*, ♀, p. 120.

## PLATE XII.

- Fig. 1. *Epamera sappirus*, ♂, p. 117.  
 2. " *mermis*, ♂, p. 117.  
 3. *Argiolaus silas*, var. *lalos*, ♂, p. 117.  
 4. " " " ♀, p. 117.  
 5. " *lukabas*, ♂, p. 117.  
 6. " *julius*, ♂, p. 117.  
 7. " *paneperata*, ♂, p. 117.  
 8. " *menas*, ♂, p. 117.  
 9. " " " ♀, p. 117.

7. On some Additions to the Australian Spiders of the Suborder Mygalomorphæ. By H. R. HOGG, M.A., F.Z.S.

[Received May 6, 1902.]

(Plate XIII.<sup>1</sup> & Text-figures 22-27.)

A numerous collection of Spiders belonging to the South Australian Museum, Adelaide, very kindly sent me by Professor Stirling, F.R.S., has enabled me to make some important additions to those I enumerated in a paper read to the Society last year (see P. Z. S. 1901, vol. ii. p. 218).

Of the subfamily *Actinopodinae* there are no specimens. Its Australian genus *Eriodon* Latr. has been located at Perth in the West, and in Victoria and New South Wales to the East; so it might naturally be expected to exist in South Australia, but has not so far been recorded thence<sup>2</sup>.

The *Otenizinae*, on the other hand, are well represented, and I have to contribute to that subfamily two new genera, *Blakistonia* and *Dyarcyops*, of one species each, and to the Rev. O. P. Cambridge's genus *Aganippe* two new species. As the latter seem to form with *Eucyrtops* Pocock (antice *Aganippe*) *laticr* Cambr. (Pl. XIII. fig. 5) and *Aganippe subtristis* Cambr. (Pl. XIII. fig. 6)

<sup>1</sup> For explanation of the Plate, see p. 142.

<sup>2</sup> I may here mention on the authority of the Rev. O. P. Cambridge that his species, *Eriodon formidabile*, has really only *four* spinnerets, as I suggested in the paper above cited, and not *six*, as originally stated (Journ. Linn. Soc., Zool. vol. x. 1868, p. 266).

an almost continuous series, I have reunited Mr. Pocock's genus with its parent.

From Tasmania we have two females of the subfamily *Miginae*, which has hitherto comprised in its group *Migea* only two genera: *Migas* L. Koch, from New Zealand, and *Moggridgea* Sim., from South Africa. From both of the above these specimens differ essentially, and I have therefore constituted for them a new genus *Heteromigas*.

Of *Barychelinae* there are no fresh specimens.

Of *Avicularinae* one male and six females confirm our previous knowledge of *Selenocosmia stirlingi* Hogg, and I note below a few additional particulars. The male from Cockburn and two females from Broken Hill extend the known southern limit of this species to lat. 32° S. From Palmerston, in the Northern Territory, is a very fine specimen, having much in common with the above, but with a recurved instead of procurved thoracic forea. This has always been looked upon as a point of great persistence and of undoubted generic importance. I have therefore constituted for it a new genus, *Selenotholus*. A broken specimen included with these is marked *Australia* only. It belongs to the group *Eurypelmateae*, known only from S. America, and as the origin is not authenticated it is more probable that it has been imported from there than really found indigenous in Australia.

The *Diplurinae* are represented by specimens from numerous new localities, notably by examples of my genus *Chenistonia*, among which is a well-marked new species. A single male shows in an interesting manner the peculiar median tibial spur which has been the unique distinguishing characteristic of this genus; but it differs from it in having a strongly procurved thoracic fovea and posterior sternal sigilla away from the margin, with other differences looked on as generic characters, and I have accordingly thus distinguished it as the type species of a genus *Dekana*.

Five females from the Adelaide Hills, though lighter in colour, are, without the male, specifically undistinguishable from my Victorian species, *Chenistonia maculata*, from Macedon.

From Tasmania is a new species in the genus *Aname* L. Koch.

The Rev. O. P. Cambridge very kindly placed at my disposal a specimen (female), received by him from Sydney, of the group *Atracae* in the above subfamily. This, though somewhat paler than his description, is with little doubt L. Koch's *Hadronyche cerberea*, also from Sydney, but the type specimen of the species not being available it is not certainly known.

The comparison enables me to assure myself that the male I had previously recorded from Macedon, Victoria, and thought might be the unknown male of this species, is certainly not the same. I therefore record the latter now as a new species, *Hadronyche meridiana*. The description appears in the above-mentioned paper (*loc. cit.* p. 274).

Out of 40 specimens sent me in this suborder, comprising examples of nine genera and eleven species, mostly from new

localities in South Australia, but one Tasmanian, no less than five genera and nine species are new, thus emphasizing the fact of how little the members of it move about in the course of very long periods of time.

To a New Zealand genus of the family Ctenizidæ I gave the name (Proc. Zool. Soc. 1901, vol. ii. p. 236) *Maoriana*, which I have since found to be preoccupied for a genus of Mollusca (Trans. N.Z. Inst. xxiii. p. 95). I therefore substitute for it the name *Cantuarica*, reminiscent of the Province from which the specimens named were sent to me.

I do not repeat the references for genera and species given in the paper quoted, as I look on this as supplementary to it.

### Subfamily MIGINÆ.

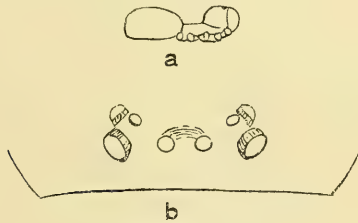
#### Group MIGEÆ.

#### HETEROMIGAS, gen. nov.

*Heteromigas* differs from *Migas* L. Koch in having a straight or slightly procurved thoracic fovea, instead of strongly recurved. The eye-space is broad instead of compact, covering about one-half the width of the frontal area. The clypeus is as wide as the whole eye-space, instead of the front median eyes only. The second and third joints of the superior spinnerets are compressed into the first joint, their presence being hardly more than indicated.

Type species, *H. dovei*.

Text-fig. 22.



*Heteromigas dovei*.

*a*, profile (nat. size); *b*, eyes.

#### HETEROMIGAS DOVEI, sp. nov. (Text-fig. 22.)

Cephalothorax, mandibles, lip, and maxillæ rather light yellow-brown, the eye-space black at each end and between the front middle eyes; sternum, coxæ, legs, and palpi somewhat brighter yellow, with dark grey or brown hairs, spines, and bristles; abdomen dark grey, without recognizable pattern.

The *cephalothorax* is rather longer than broad, narrowed posteriorly, but broad in front. The cephalic part is rounded

and rises abruptly from in front of the thoracic fovea almost as prominently as in *Eriodon*, the mandibles being continued in the same manner, but, as in all the *Miginae*, falling nearly perpendicularly after a short, more or less kneed, horizontal length. The fangs are long and very powerfully formed, with a transverse section almost square by reason of four strengthening longitudinal ridges. There is no rastellum. On the inner edge of the falx-sheath are three large teeth, on the outer four, and five or six small, intermediate, near the base of the fang. The eye-space, three times as wide as long, extends half the width of the front of the cephalic part. The front median eyes are  $1\frac{1}{2}$  diam. apart, and two of their diameters from the nearest point of the laterals, which are oval and two diameters of the median in greatest length. The whole row is slightly procurved.

The posterior row is recurved, shorter than the front row, and the laterals only slightly more in longer diameter than the front median. The rear median, in long diameter the same as these, are half that distance from the rear side and their diameter from the front middle. The clypeus is wide, the front median being removed from the margin by a distance equal to the whole breadth of the eye-space. The thoracic fovea is deep, wide, and nearly straight, but with a distinct tendency to procurvature.

The *maxillae* are broad and nearly square, the lower outer corner being somewhat rounded. There are spines along the inner side margin but not along the lower side. The *lip* is as long as broad, slightly rounded in front, and in one piece with the sternum, though separated by a depression containing the anterior sigilla; it has no spines.

The *sternum*, smooth and strong, is piriform, narrowed, and slightly hollowed in front. The posterior sigilla are large and situated near the central line, the remainder marginal.

The *abdomen* is oval,  $1\frac{1}{2}$  times as long as broad. The superior spinnerets are short and stout, the first joint making the whole of their length, and the second and third joints indicated by only slightly raised circular rims successively inside one another. The inferior spinnerets are cylindrical, truncate at top, about  $1\frac{1}{2}$  diameters apart. The *palpi* are longer than in the *Miginae* generally, more nearly approaching those of the *Ctenizidae*. The femoral joints are much curved round the mandibles and as long as the patella cum tibia. The distal segment is broad at base, but tapering, and furnished with two rows of short, stout, curved spines as on the tarsus and metatarsus of the front two pairs of legs.

The *legs* are short and stout, the metatarsus and tarsus of the front two pairs being somewhat flattened and having two rows of stout, curved, spines along their inner and outer margins. The superior tarsal claws have two pectinations on the inner, and one long one near the base, on the outer margin. The inferior claw is smooth.

Two females from Table Cape, North Coast of Tasmania. Collected by Mr. Dove.

*Measurements in millimetres.*

	Long.	Broad.
Cephalothorax ...	6	5
Abdomen .....	$7\frac{1}{2}$	5
Mandibles .....	3 total length. $1\frac{1}{2}$ horizontally.	

	Coxa.	Trochanter & femur.	Patella & tibia.	Metatarsus & tarsus.		
Legs .....	1.	2.	4	4	3	= 13
	2.	2	4	4	3	= 13
	3.	2	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	= $12\frac{1}{2}$
	4.	2	5	5	5	= 17
Palpi .....	$1\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	2	=	$10\frac{1}{2}$

## Subfamily CTENIZINÆ.

The following synopsis will serve to distinguish the Australian and New Zealand genera:—

1. Abdomen corrugated, two strongly marked muscle-spots on upper side of abdomen. The eyes of the front row situated at the four corners of a trapezium markedly longer than broad ..... *Idiosoma*. (Pl. XIII. fig. 8.)
2. Abdomen smooth or hairy, but with no corrugations. Trapezium formed by the four eyes of the front row, in all cases broader than long ... 2.
3. Front row of eyes procurved; but a line touching the upper points of the laterals lies not more than  $\frac{1}{2}$  their diameter below that touching the lower edge of the median pair ..... 3.
- Front row of eyes so much procurved that a line joining the upper points of the laterals lies at least their diameter below one touching the lower edges of the median ..... 5.
3. The line joining the centres of the rear row of eyes straight or recurved ..... 4.
- The line joining the centres procurved ..... *Dyarcycops*, gen. nov.
4. Posterior sternal sigilla moderate in size and marginal ..... *Arbanitis*. (Pl. XIII. fig. 11.)
- Posterior sternal sigilla large and removed from the margin ..... *Cantuarina*.
5. The line joining the lowest points of laterals of rear row of eyes passing below the centres of the median pair of the front row ..... *Anidiops*. (Pl. XIII. fig. 9.)
- The line joining the lowest points of laterals of rear row of eyes passing above the upper points of the front medians ..... 6.
6. The whole eye-space much broader than long ( $1\frac{1}{2}$ – $2\frac{1}{2}$  times); the front two pairs of legs scopulated on tarsi only ..... *Aganippe* (including *Eucyrtops* Poc.)
- The whole eye-space more nearly square, the breadth not exceeding  $1\frac{1}{4}$ – $1\frac{1}{2}$  times the length; the metatarsi of front two pairs of legs scopulated ..... *Blakistonina*, gen. nov.

I append for comparison a series of diagrams of the eyes of members of this subfamily, showing the manner in which they vary. I have carefully measured the various specimens from which they are taken and drawn all to the same scale ( $\times 10$ ).

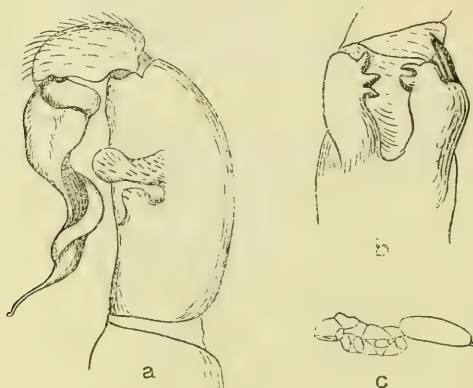


## Genus AGANIPPE Cambr.

*Synopsis of Species.*

- |  |                                |
|--|--------------------------------|
| 1. The laterals of the front row of eyes one diameter only apart in male, at least ..... | <i>A. smeatoni</i> , sp. nov.  |
| The laterals of the front row of eyes not less than about two diameters apart .....      | 2.                             |
| 2. The whole eye-space about $2\frac{1}{2}$ times as broad as long ...                   | <i>A. latior</i> Cambr.        |
| The whole eye-space clearly less than twice as broad as long .....                       | 3.                             |
| 3. Lateral eyes of the front row about two of their diameters apart .....                | <i>A. pulleinei</i> , sp. nov. |
| Lateral eyes of the front row more nearly four diameters apart .....                     | <i>A. substriata</i> Cambr.    |

## Text-fig. 23.

*Aganippe smeatoni.*

*a*, male palp; *b*, anterior end of tibia i. of male from inner side;  
*c*, profile (nat. size).

## Genus AGANIPPE Cambr.

AGANIPPE SMEATONI, sp. nov. (Plate XIII. fig. 7 & text-fig. 23.)

Cephalothorax and mandibles rich yellow-brown; lip, maxillæ, sternum, and coxæ somewhat brighter, with rather pale yellow hair, short and fine, and short stout dark brown bristles. Legs yellow-brown, lighter than cephalothorax. Abdomen yellow above with darker brown median area, underneath dark yellow-grey; in some specimens the upper median area is almost black.

The *cephalothorax* is longer than broad, narrowed to nearly one-half both anteriorly and posteriorly, rounded at sides. The cephalic part rises gradually from a deep fovea and side depressions to the eye-space, behind which is a transverse depression. The cephalic fovea is straight or slightly procurved and lies at the bottom of an elliptical depression. A fringe of stout short procurved spiniform setæ runs round the margin of the thoracic area, and there are two broad depressions on each side from the end of the fovea to the margin.

The front median *eyes* are half their diameter apart, the laterals of the same diameter, three-fourths of a diameter away, lie in front of them near the margin of the clypeus, one diameter only apart. The clypeus is about half their diameter in breadth. The rear row is straight, the oval laterals of the same diameter as the front, total length of the row being twice that of the front lateral pair, or six long diameters. The rear medians are very round, half the diameter of the other eyes, four diameters apart,  $1\frac{1}{2}$  from the laterals and the same from the front median.

The *mandibles* are short and protrude horizontally not more than one-fourth of the length of the cephalothorax. The *lip* is broader than long, straight in front, and without spines. There are a few spines on the inner side of the *maxillæ*, near the base; they are rather thickly covered with hair, straight in front, and only pointed in the middle of the basal end.

The *sternum* is ovate, rather wide posteriorly, covered with upright bristles on round bases. The posterior sigilla are as far from the median line as they are from the margin. The stigma of the male *palp* is rather long and twisted like a ram's horn; between the large bulb from which it springs and the metatarsal joint is a smaller bulb. On the tibial joint is a double apophysis thickly covered on the outside with short tapering three-sided spines.

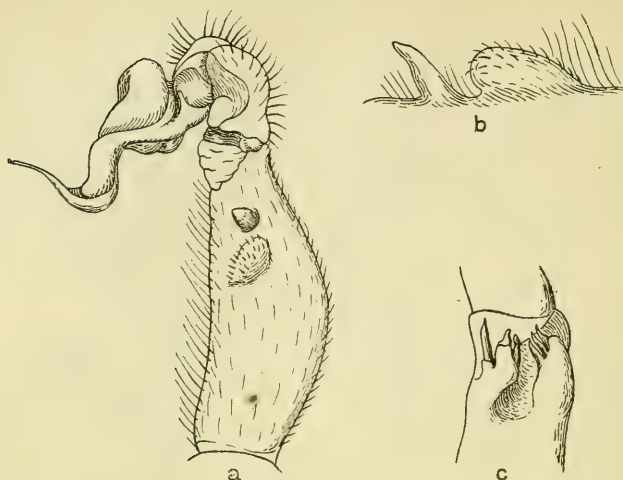
The *legs* are rather long and thin. The whole of the metatarsi are bespined; on the tarsi of all legs, except the first pair, are stout spiniform setæ. The front two pair of tarsi are scopulated, but in one specimen, which shows no other difference, there is no scopula on tarsus i. A double apophysis at the anterior end of tibia i. has a stout spine and two horny knobs on the outer half, and three knobs, but no spine, on the inner. The superior tarsal claws have from 4 to 9 teeth, the inferior being bare. The abdomen is oval and is thickly covered on the upper side with stout spines on rounded bases. The superior mamillæ are short and stout, the first joint longer than the other two together, the last being quite short.

There are four males sent by Mr. T. D. Smeaton, of Blakiston, but without locality indicated, and I have named the species after him.

The measurements in millimetres are as follows:—

		Long.	Broad.			
Cephalothorax	...	8	{ 4 front. 7			
Abdomen	.....	9	7			
Mandibles	.....	4	2 horizontally			
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.	
Legs	.....	1. 4	10	9	8	= 31
		2. 4	$9\frac{1}{2}$	$8\frac{1}{2}$	$7\frac{1}{2}$	= $29\frac{1}{2}$
		3. 4	8	7	$9\frac{1}{2}$	= $28\frac{1}{2}$
		4. 4	$10\frac{1}{2}$	10	12	= $36\frac{1}{2}$
Palpi	.....	3	$5\frac{1}{2}$	$5\frac{1}{2}$	2	= 16

Text-fig. 24.

*Aganippe pulleinei.*

*a*, male palp; *b*, apophyses on tibial joint of palp from side;  
*c*, anterior end of tibia i. of male from inside.

*AGANIPPE PULLEINEI*, sp. nov. (Plate XIII. figs. 3, 4, & text-fig. 24.)

Cephalothorax, mandibles, lip, maxillæ, and sternum bright yellow, the eye-space mostly black; the coxæ and femora of the legs are orange, the patellæ and tibiæ darker; the metatarsus and tarsus yellow. On the mandibles are rather long brown hairs, but elsewhere the hairs are all changed to bristles, and on the legs and sternum into spines. The abdomen is yellow, with brown spinous setæ on the upper part.

The *cephalothorax* is longer than broad, narrowing in front to less than half its total width. The cephalic part, moderately raised and rather narrow, is bounded by a rather deep side depression. The fovea is straight or slightly procurved; a row of stout setæ extends round the margin. The *mandibles* are short but rather more protrudent than the last described, the fangs long and curved. There are seven rather small teeth on each of the edges of the falx-sheath and five quite small in an intermediate row.

The *lip* is at least twice as broad as long, slightly hollowed in front and without spines. The *maxillæ* are rounded at base and straight in front, without prominences. A few spines on the inner lower corner.

The *sternum* is piriform, half as broad in front as between 2nd and 3rd legs, clothed with short upright spinous bristles on bases. Posterior sigilla away from margin.

The *palpi* are twice the length of the cephalothorax, the tibial joint of the male being considerably swollen in the middle, and with two apophyses, one above the other, on the side. The stigma is  $1\frac{1}{2}$  times as long as the bulb, and is twisted, but not so much as in *A. smeatoni*.

The front middle *eyes* are  $1\frac{1}{4}$  diameters apart. In the male these are as large as the long diameter of the laterals, but in the female only  $\frac{3}{4}$ ths. The front laterals are two of their diameters apart; they are in the male the long diameter away from the median, in the female  $1\frac{1}{2}$ . The rear row is recurved, both laterals and median oval, the latter in the female being as large as the front median, from which they are distant the diameter of the side eyes. They are somewhat nearer than this to those of the rear side, which are as long as the front side eyes. The trapezium formed by the rear median and front laterals is very slightly narrowed in front.

The *legs*, rather thin and tapering, are somewhat thickly covered with bristly spines. The apophyses at the anterior end of tibia 1 of the male are hardly to be distinguished from those of *A. smeatoni*. The pectinations on the superior tarsal claws vary from 7 in front to 3 on the outer rear claw.

The *abdomen* is oval, the upper side being furnished with spiniform setæ, both upper and under side are covered with short fine hair.

The superior spinnerets are short and stout, the first joint longest, the third quite short. The inferior are one diameter apart.

The female is coloured the same as the male, and is probably not fully grown; except in the smaller size of the front middle eyes she does not differ from the males, and comes from the same locality, so that I take them to correspond. Three males and the female come from Blakiston, and one male from the coast at Hallett's Cove. I have named them after the sender of the latter, Mr. W. Pulleine, jun.

*Measurements in millimetres.*

	Male.		Female.	
	Long.	Broad.	Long.	Broad.
Cephalothorax ...	10	$\left\{ \begin{array}{l} 4 \\ 8\frac{3}{4} \end{array} \right.$	$8\frac{1}{2}$	$\left\{ \begin{array}{l} 5 \text{ front.} \\ 7 \end{array} \right.$
Abdomen .....	11	9	$10\frac{1}{2}$	$8\frac{1}{2}$
Mandibles .....	$\left\{ \begin{array}{l} 4\frac{1}{2} \\ 4 \text{ horizontally.} \end{array} \right.$		$\left\{ \begin{array}{l} 5 \\ 4 \text{ horizontally.} \end{array} \right.$	

Male.

		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.		
Legs .....	1.	5	11	11	11	=	38
	2.	$4\frac{1}{2}$	11	11	$11\frac{1}{2}$	=	38
	3.	4	10	$9\frac{1}{2}$	13	=	$36\frac{1}{2}$
	4.	$4\frac{1}{2}$	$12\frac{1}{2}$	$12\frac{1}{2}$	17	=	$46\frac{1}{2}$
Palpi .....		$4\frac{1}{2}$	7	$6\frac{1}{2}$	2	=	20

## Female.

		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.		
Legs .....	1.	4	6	6	4	=	20
	2.	$3\frac{1}{2}$	6	6	4	=	$19\frac{1}{2}$
	3.	3	$6\frac{1}{2}$	$5\frac{1}{2}$	$5\frac{1}{2}$	=	$20\frac{1}{2}$
	4	$3\frac{1}{2}$	$8\frac{1}{2}$	$8\frac{1}{2}$	$7\frac{1}{2}$	=	28
Palpi .....		$3\frac{1}{2}$	$5\frac{1}{2}$	$4\frac{1}{2}$	3	=	$16\frac{1}{2}$

## DYARCYOPS, nov. gen.

*Dyarcyops* differs from *Arbanitis* L. Koch, to which it is allied, in having both rows of eyes procurved, the front median eyes more than their diameter apart, the cephalic part of the cephalothorax comparatively high, the thoracic fovea straight, deep, and long; it has only a few pectinations on the superior tarsal claws; and, from the greater procurvature of the front row, the whole eye-space is longer in comparison with its breadth than in the above-named genus.

Type species, *D. andrewsi*.

DYARCYOPS ANDREWSEI, nov. sp. (Plate XIII. fig. 10 & text-fig. 25 a.)

Cephalothorax dark reddish brown, with fine yellowish-brown hair; mandibles darker still, with brown hair or bristles. Sternum, lip, maxillæ, and coxæ rich yellowish brown, with long brown hair, rather inclined to yellow on the maxillæ and red on the fringes. Legs and palpi yellow-brown, abdomen dark grey reticulated spots on yellow-brown ground.

The thoracic part of the *cephalothorax* is rather flat, the cephalic part rising somewhat abruptly from in front of the fovea, which is broad, deep, and transversely straight.

The whole cephalothorax, somewhat broad in front, is one-third longer than broad, and longer than the patella and tibia of any of the legs. The mandibles are large and extend below the base of the cephalothorax. The abdomen is ovate, rather straight in front: the superior spinnerets short and stout, the first joint longer than the other two together, the third quite short and almost hemispherical; the inferior one diameter apart.

The front row of *eyes* is strongly procurved, the laterals  $1\frac{1}{2}$  diameters of the medians, having their highest part below the lower margin of the latter pair, which are one and a third of their diameter apart. The rear side eyes are slightly smaller than the front, and separated from the latter by two of their own diameters. The centres of the rear medians are on a level with the upper part of the laterals, making the whole row clearly procurved. The total eye-space is well raised up and  $1\frac{1}{2}$  times as broad as long.

The *mandibles* are stout and long, well arched, and their lowest point reaches to below the level of the sternum. The fangs are long and powerful. The rastellum consists of two rows of stout



teeth, reaching halfway across the front and some distance up the inner edge of the falx. The teeth on the falx-sheath consist of five large and three smaller on the inner edge and five at the lower end of the outer edge.

The *maxillæ* are broad, straight in front, with only a small protuberance on the inner corner. The lower end is rounded and curved in round the lip, that portion being rather thickly studded with spines. The *lip* is sunk below the *maxillæ*; it is about as long as broad, straight in front, and without spines.

The *sternum* is broadest opposite the third pair of *coxæ*, where the fourth pair of *sigilla* show prominently a little away from the margin, the others being marginal.

The *abdomen*, rather deeply pitted, is covered with fine hair and a few bristles on roots on the upper side; it is longer than broad, somewhat ovate truncate in front and rounded at rear. The superior spinnerets are short and stout, the first joint longer than the other two together, the third being almost hemispherical; the inferior pair are about their diameter apart.

The *legs* are rather short and stout, the fourth pair scarcely longer than the first. The metatarsi and tarsi of front two pairs are thickly scopulated, but none on either joint of third and fourth pair. The superior tarsal claws are long, stout, and strongly curved, having one longish pectination near the base on the outer claw and two on the inner. The third claw is smooth, and there is one pectination at the base of the female palp-claw.

Four females (two not quite adult), taken by Mr. F. W. Andrews at Mount Compass, South Australia.

*Measurements in millimetres.*

		Long.	Broad.		
Cephalothorax ...		12	{ 7 in front, 9		
Abdomen .....		11			
Mandibles .....		6½	4 horizontally.		
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.
Legs .....	1.	5	11	10	8 = 34
	2.	4½	9	9	7 = 29½
	3.	3½	8	6	7 = 24½
	4.	4½	10	11	9 = 34½
Palpi.....		5	9	7½	5 = 26½

*BLAKISTONIA*, nov. gen.

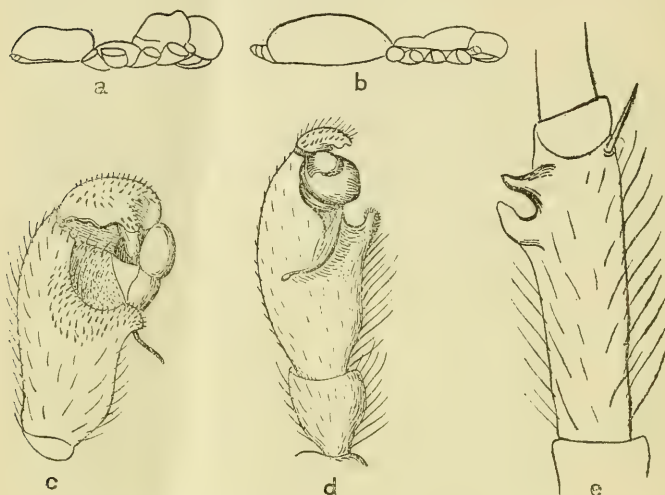
I have somewhat doubtfully constituted a new genus for two females from the same neighbourhood as the two new species of *Aganippe*, which I call, after the locality, *Blakistonia*.

It differs from *Aganippe* in the much squarer eye-area; the rear side eyes are larger than any of the others. The lip is as long as broad, furnished with short, stout, unusually tapering spinules;

the third joint of the spinnerets only slightly shorter than the second; stouter legs, the metatarsi of the front two pairs scopulated, all tarsi bespined, and different type of apophyses on tibia i. of male.

Type species, *B. aurea*.

Text-fig. 25.



*Dyarcyops andrewsi* (a) and *Blakistonina aurea* (b-e).

a, b, profiles (nat. size); c, male palp from inner side; d, male palp from outer side; e, tibia i. of male from under side.

**BLAKISTONINA AUREA**, sp. nov. (Plate XIII. figs. 1, 2, & text-fig. 25 b-e.)

*Female*. Cephalothorax dingy yellowish brown, mandibles brown, rastellum nearly black, lip and maxillæ yellowish brown; sternum pale yellow, with deeper orange spots; legs yellowish brown, with dark grey hair on patella, tibia, tarsus, and metatarsus; abdomen bright golden yellow, with pale yellow hair on both upper and under side.

The *cephalothorax* is longer than broad by nearly one-fourth, and only one-fourth narrower in front and rear than in the widest part. The cephalic part is well raised up from the slightly procurved thoracic fovea, bounded by side depressions and highest behind the eye-space. The mandibles are prominent, more than one-third the length of the cephalothorax horizontally. Teeth as in male.

The eye-space is unusually depressed, in fact barely raised up at all. The front median *eyes* are their diameter apart; the laterals, which are  $1\frac{1}{2}$  diameters of same, are two of their own diameters apart, two diameters of the median away from the latter, and situated on the margin of the clypeus, thus forming an

entirely separate row. The centres of the rear row are in a straight line, all four eyes oval and longitudinally parallel. The long diameter of the median equals that of the front middle eyes, and the rear laterals, twice the length of these, are one-third of their length away from the medians, which are not quite three of their own long diameters apart.

The *lip* is as long as broad, very convex, rounded at the base, and straight in front. It is furnished with rather thick ordinary bristles and stout spines on the upper half, tapering from base to point. The *maxillæ* are rather wide, rounded at the lower outer corner and curving round the lip. They are straight in front. On the inner lower corner they have an area with spines, much like those on the lip, but longer.

The *sternum* is piriform, narrowest in front; the posterior sigilla are moderate in size, about their diameter from margin, the remainder close to it.

The *legs* are rather short and stout. The metatarsus and tarsus of front two pairs somewhat flat, thickly scopulated, and particularly short, with stout spines on the under side of both joints. The superior tarsal claws have from one to three long basal pectinations only and are much curved. The third claw is small and bare.

The *abdomen* is oval, with fine down-lying hair and long fine bristles on the upper part. The superior spinnerets are short and stout. The first joint about equal to the other two, the third hemispherical at the anterior end. The inferior spinnerets are very small and about their diameter apart.

*Male.* Colouring like the female. The long dark spinous bristles on the upper part of abdomen give the latter a darker colour than in the female (supposed). The under side also is covered with thicker and longer brown hair.

The front median *eyes* are of the same diameter as the front laterals, the former  $\frac{1}{2}$  and the latter  $1\frac{1}{4}$  diameters apart. The rear row is straight, the laterals being in long diameter larger than those of the front row. The whole eye-space, though of the same proportionate length and breadth, is only two-thirds the size of that of the (supposed) females, but the eyes appear closer together owing to their larger comparative size. A long median row of long spinous bristles runs from near the thoracic fovea to the margin of the clypeus.

The *lip* and *maxillæ* are unbespined. The sternum is pear-shaped; the posterior sigilla away from margin, small and apparently slightly convex. The teeth on the inner edge of the falx-sheath are small and six in number. On the outer edge and intermediately are 14 or 15 spread indiscriminately, some very small. The *legs* are long and rather thin. The superior tarsal claws have five or six pectinations. The tarsi of the front two pairs only are scopulated and the anterior end of the metatarsus. Near the anterior end of tibia 1 are two horny apophyses longitudinally, one below the other on the inner side. There are spines on all metatarsi and on tarsi 3 and 4, but not on 1 and 2.

On the outer side of the tibial joint of the palpi is one apophysis near the anterior end, its upper side covered with small triangular spinules and a considerable area behind it. The cap of the metatarsal joint is also similarly covered with spinules. The stigma is nearly twice the length of the bulb, pointed at the end and twisted into a thin laminated sheet about the middle.

One male from Lower North Road, Adelaide.

Four females from Blakiston and the Mt. Lofty ranges.

*Measurements in millimetres (female).*

		Long.	Broad.		
Cephalothorax ...	11	{		4 in front.	
Abdomen .....	16			8	
Mandibles .....	4	horizontally.			
Superior spinnerets	2, 1, $\frac{3}{4}$ = $4\frac{1}{4}$ .				
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.
Legs .....	1.	$4\frac{1}{2}$	8	$7\frac{1}{2}$	$5\frac{1}{2}$ = $25\frac{1}{2}$
	2.	4	$7\frac{1}{2}$	7	$5\frac{1}{2}$ = 24
	3.	4	7	$6\frac{1}{2}$	5 = $22\frac{1}{2}$
	4.	$4\frac{1}{2}$	8	10	8 = $30\frac{1}{2}$
Palpi.....		$4\frac{1}{2}$	7	6	4 = $21\frac{1}{2}$

*Measurements in millimetres (male).*

		Long.	Broad.		
Cephalothorax ...		7	$\left\{ \begin{array}{l} 4 \text{ in front.} \\ 6 \end{array} \right.$		
Abdomen .....		7		4	
Mandibles .....		3	2 horizontally.		
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.
Legs .....	1.	$3\frac{1}{2}$	8	9	8 = $28\frac{1}{2}$
	2.	3	$7\frac{1}{2}$	8	$7\frac{1}{2}$ = 26
	3.	3	6	$6\frac{1}{2}$	$7\frac{1}{2}$ = 23
	4.	3	8	10	10 = 31
Palpi.....		3	5	5	2 = 15
Spinnerets .....	1,	$\frac{3}{8}$ , $\frac{3}{8}$	$= 1\frac{3}{4}$ .		
Inferior do.	very small, about $\frac{1}{4}$ , and close together.				

Subfamily AVICULARINÆ.

Group SELENOCOSMIEÆ.

SELENOTHOLUS, nov. gen.

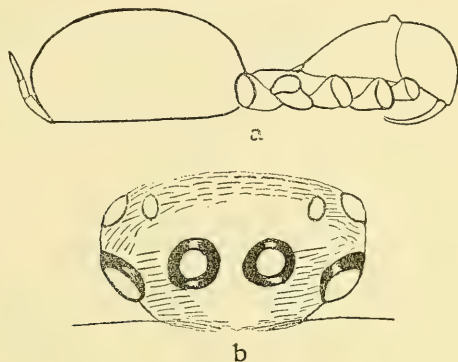
Differs from *Selenocosmia* in having the thoracic fovea recurved. Rear and front legs of equal stoutness.

Type species, *Selenotholus foelschei*.

## SELENOTHOLUS FOELSCHER, nov. sp. (Text-fig. 26.)

*Female.* The cephalothorax is reddish, covered with short yellow to yellow-brown hair. Mandibles darker, with thick, but smooth downlying yellow-brown hair, darkest in front; fangs black-brown, but the outer side by palp bright red. Lip and maxillæ red-brown with reddish hair. Sternum and coxæ deep brown: rest of legs and palpi same as mandibles; the patella of third and fourth pairs somewhat darker. The abdomen, both upper and under sides, is a rich golden brown covered with smooth glossy hair.

Text-fig. 26.

*Selenotholus foelscheri.*

a, profile (nat. size); b, eyes.

The *cephalothorax* is one-eighth part longer than broad, sloping moderately upwards from the clearly-recurred thoracic fovea lying between the second and third pair of legs to the eye-space, which is more than  $2\frac{1}{2}$  times as broad as long and situated on a tubercle,  $3\frac{1}{2}$  mm.  $\times$  2, reaching to the margin of the carapace.

The front row of *eyes* is slightly procurved, the median pair  $1\frac{1}{2}$  diameters apart and  $1\frac{1}{4}$  of their diameter from the laterals; they are of a bright orange colour, standing on transparent black rims, which I have not allowed for in their size. The front laterals are  $1\frac{1}{2}$  times the diameter of the median, and, together with the rear row, are of a pale yellow. The rear row is straight; the laterals, half the diameter of the front laterals, are as far from them as the latter from the front median. The rear median, slightly smaller than the laterals in long diameter, are their breadth away from the latter and twice their length from the front median and ten times their own breadth, or five diameters of the front middle, apart.

The *mandibles* are thickly covered with close-lying hair, the fangs long and powerful, the inner margin of fang-sheath furnished with about 12 large teeth, and the intermediate area with about 50 smaller, reaching almost to base of fang. The stridulating-



organ on the outer side of the falx is spread over a more or less oblong area, and consists of series of sharp spines placed in very regular rows. The corresponding portion on the base of the palpi is a long oval area of spines, shorter and broader but generally similar.

The *maxillae* are broad, rounded at the base, curved round the lip, and moulded at the inner upper corner into a well-defined prominence; club-shaped spines are numerous across the base, and a few stretching up the lower part of the inner side. The *labium* is broader than long, hollowed in front, and has a thick cushion of spines extending from the inner edge to halfway down the front.

The *sternum* is as broad as long, truncate in front; the posterior sigilla, large and oval, are situated nearer to the median line than to the margin. It is only slightly convex and thickly covered with matted hair. The *legs* are rather equally stout, there being no difference between the first and fourth pairs. The scopulae on all the tarsi are integral, on the metatarsi of the front two pairs they reach to the base, nearly so on the third pair, and halfway up on the fourth. There are no spines on any of the legs, but double bare streaks on patella and tibia i., ii., and iii., single on iv.

The *abdomen* is ovate, truncate, and narrowest anteriorly. The hairing is specially bright and silky in texture, of the same colour all over, above and below. The spinnerets are half the length of the cephalothorax, tapering from base to anterior end, the first joint longer than the third and both longer than the second.

The recurvature of the cephalic fovea is a generic character that cannot be ignored. It resembles *Selenocosmia stirlingi* in general appearance, but is otherwise readily distinguishable by the straightness of the rear row of eyes, the larger number of intermediate teeth in the falx-sheath, the lip more thickly bespined, and the last joint of the spinnerets shorter than the first.

One female from Palmerston. I have named the species after the sender, Mr. P. Foelsche.

*Measurements in millimetres.*

		Long.	Broad.			
Cephalothorax ...	20		{ 14 in front. 17½ in middle.			
Abdomen .....	29½		18½			
Mandibles .....	12	total length.				
„ .....	7½	horizontally.				
Fangs .....	8					
Spinnerets.....	4½.	2,	3½ = 10.			
Inferior do. ....	2½,	2 diameters apart.				
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.	
Legs .....	1.	10	18	18	16	= 62
	2.	9	16	16	16	= 57
	3.	7	15	15	16	= 53
	4.	8½	17	17	20	= 62½
Palpi .....	9	13½	13½	13½	7½	= 43½

## Subfamily DIPLURINÆ.

## Genus CHENISTONIA Hogg.

CHENISTONIA TEPPERI, nov. sp. (Plate XIII. fig. 13.)

Cephalothorax dull red-brown (yellower brown in apparently rather younger specimens). Mandibles dark red-brown, with pale yellow downlying hairs and longer upstanding brown. Lip, maxillæ, sternum, and coxæ dark red-brown, with upstanding brown hairs only.

Legs and palpi paler red-brown, with long brown hairs, scopulæ yellowish grey.

Abdomen yellow above and below, with short downlying, almost golden hairs and a few longer and browner. The *cephalothorax* is nearly one-fifth longer than broad, slightly rounded at sides, a third part narrower in the front and rear than in the middle, and rising in a moderate slope from in front of a straight thoracic fovea two-thirds of the length of the cephalothorax from the anterior end.

The eye-space is on a somewhat rectangular raised prominence, which begins at a distance the diameter of the front middle eyes away from the margin of the clypeus. The front row of *eyes* is slightly procurved. The median pair, barely their diameter apart and only one-third from the nearest point of the laterals, are two-thirds the diameter of the latter, and stand on black shiny rings. The rear laterals, as far from the front laterals as the latter from the front median, are only slightly larger than the front median. The rear medians nearly touching the laterals are about as long as the front median, half their diameter from them; the rear row is distinctly recurved.

The *mandibles* are stout and rather longer perpendicularly than they are horizontally, the bristles on the fore part distinctly hardened, the fangs long and well curved. A row of eight large teeth on the inner edge of the falx-sheath and five small in the intermediate space at the lower end. The *lip* is slightly broader than long, hollowed in front and without spines. The *maxillæ* have a rather broad rounded base, are hollowed round the lip, and straight in front. They are thickly covered with spines over half the breadth of the basal area.

The *sternum* is a broad oval, slightly convex, and having the sigilla all marginal. The *legs* are moderately long and stout; the tarsi of all four pairs have a thick scopula, as also the metatarsi of the front two pairs. None of the tarsi but all the metatarsi are bespined, and two pairs of short spines on patella iii. All the patellæ have a broad longitudinal bare streak. The superior tarsal claws have about 8 or 10 pectinations in each of their two rows. The third claw short and bare and nearly straight.

The *abdomen* is oval, thickly covered with short furry hair intermixed with a few long single ones. The inferior spinnerets are close together. The superior, tapering from the base, are one

third the length of the cephalothorax, the third joint being rather longer than the first and the second shortest.

Five females from Ardrossan, Kangaroo Island, Burnside, and Blakiston, I have named after Mr. Tepper, who has collected them from several of the localities.

*Measurements in millimetres.*

		Long.	Broad.				
Cephalothorax ...		12	{ $6\frac{1}{2}$ in front. $9\frac{1}{2}$				
Abdomen .....		13			8		
Mandibles .....		$7\frac{1}{2}$	4 horizontally.				
„ .....							
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.		
Legs .....	1.	5	10	11	$9\frac{1}{2}$	=	$35\frac{1}{2}$
	2.	5	10	10	9	=	34
	3.	$4\frac{1}{2}$	9	9	10	=	$32\frac{1}{2}$
	4.	$4\frac{1}{2}$	11	11	12	=	$38\frac{1}{2}$
Palpi .....		5	8	7	5	=	25
Superior spinnerets.....		$1\frac{1}{2}$ , 1,	$1\frac{3}{4}$	=	$4\frac{1}{4}$ .		

DEKANA, nov. gen.

*Dekana*, allied to *Chenistonia* by the almost unique position of the tibial palpal spur of the male, differs from the latter in having the thoracic fovea procurved and the posterior sternal sigilla rather large and removed from the margin by a distance equal to that from the median line.

Type species, *D. diversicolor*.

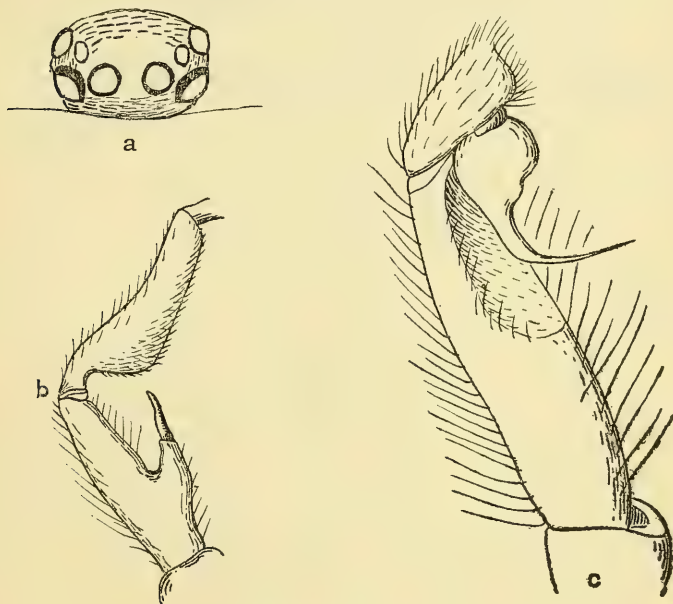
DEKANA DIVERSICOLOR, nov. sp. (Text-fig. 27.)

*Male*. Cephalothorax dark red-brown, mandibles black-brown, short fine downlying hair silvery white, and upstanding longer brown. Lip, maxillæ, sternum, and coxæ pale chestnut. Legs and palpi red-brown, lightening towards the extremities, scopulæ greyish yellow. Abdomen black above and underneath. Front abdominal shield, gill-covers, and spinnerets yellow, hairing silver-grey above, yellow on sides and underneath.

The *cephalothorax* is 2 millimetres longer than broad, rounded at sides, broadly truncate in front, somewhat narrower at rear end, which is concave. The cephalic part is only moderately raised up, the highest part being about the middle behind the eyes, which are situated on a well-developed oval prominence rising abruptly from almost the margin of the clypeus. The front middle *eyes*, green, the remainder being yellow, are three-fourths of their diameter apart and half that distance from the nearest point of the laterals which are  $1\frac{1}{4}$  their diameter. These are set in a plane perpendicular to the cephalic surface, and being at the lower part of the prominence make the row, which is straight seen from above, rather strongly procurved from in front.

The rear row is recurved, the laterals half their diameter from those of the front row are the same in length as the front median. The somewhat square rear median are two-thirds the diameter of the laterals, nearly close up to the latter and half their diameter from the front median. The eye-space is  $18 \times 7$ , the whole prominence  $18 \times 10$ . The cephalic fovea is lunate and very clearly procurved.

Text-fig. 27.

*Dekania diversicolor.*

*a*, eyes; *b*, tibia and metatarsus i. of male; *c*, male palp.

The *mandibles* are rather long compared with their breadth, and stand out horizontally half the length of the cephalothorax. There are nine large teeth on the inner falx-sheath, five quite small in an intermediate row at the lower end. The *lip*, straight at the sides, hollowed in front, is broader than long and has one spine only visible about the middle.

The *maxillae* convex at the base over half their width are thence hollowed round the lip and are straight in front. They are somewhat sparsely bespined over the whole basal area. The *sternum* is ovate, straight in front, broadest at rear, slightly convex. The posterior sternal sigilla are long and narrow halfway between the margin and the median line. The *legs* are only moderately stout, the tarsi being all scopulated and without spines; the metatarsi are all bespined, those of the front two pairs scopulated, and the

anterior end of the two rear pairs. The metatarsus of the front pair, characteristically protuberant on the under side, springs from a narrow base, and that of the second pair is also distinctly curved.

The tibial spur is rather nearer to the base than to the front end and quite as well formed as in *Chenistonia maculata*. The superior tarsal claws are pectinated in two rows of about nine teeth in each. The third short and bare.

As in *Chenistonia* the metatarsal joint of the *palpi* is somewhat long, and cut straight across the end. The stigma is curved and finely pointed, slightly longer than the palpal bulb. The *abdomen* is oval, rather long and narrow, the yellow chitinous shield and gill-coverings being very prominent on the black ground as also the spinnerets. The inferior pair of spinnerets are well developed,  $1\frac{1}{2}$  diameters apart at the base. The first joint of the superior pair is  $1\frac{1}{2}$  times the length of the second, the third being unfortunately destroyed.

One male only from Deka Station, near Blackhall.

*Measurements in millimetres.*

		Long.	Broad.			
Cephalothorax ...		9	{ 5 in front. 7			
Abdomen .....		8				
Mandibles .....		$6\frac{1}{2}$				
„ .....		$4\frac{1}{2}$	horizontally.			
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.	
Legs .....	1.	$4\frac{1}{2}$	8	9	8	= $29\frac{1}{2}$
	2.	4	8	$7\frac{1}{2}$	8	= $27\frac{1}{2}$
	3.	$3\frac{1}{2}$	$6\frac{1}{2}$	$6\frac{1}{2}$	8	= $24\frac{1}{2}$
	4.	$3\frac{1}{2}$	9	9	10	= $31\frac{1}{2}$
Palpi .....		4	7	7	$2\frac{1}{2}$	= $20\frac{1}{2}$
Superior spinnerets.....		$1\frac{1}{2}$ , 1, —.				

Genus ANAME L. Koch.

ANAME TASMANICA, nov. sp. (Plate XIII. fig. 12.)

*Female.* Cephalothorax, mandibles, lip, maxillæ, sternum, legs, and palpi a rather dingy yellow-brown, in most parts sparsely clothed with long upstanding dark brown hairs. The abdomen is a dingy greyish yellow, with short fine downlying yellow hairs interspersed on upper side, with long thin upstanding bristles on round roots. Spinnerets and gill-covers yellow; front median eyes deep orange, with black centres on black rims, other eyes pale yellow.

The *cephalothorax* is two millimetres longer than broad, slightly raised from in front of the thoracic fovea, which is procurved, about equally narrowed at front and rear.

The *eyes* are on a well-raised tubercle, the breadth of the front median eyes from the margin of the clypeus. The front row is straight, or from in front slightly procurved, the median pair three-fourths of their diameter apart. The laterals one-half that



distance away are one-third larger. The rear row is recurved. The laterals, touching the front laterals, are the same diameter as the front median, the oval rear median, two-thirds same diameter, almost touch the side, and are half the diameter of the front median away from them. The eye-space is  $15 \times 7$ , the tubercle  $15 \times 11 \frac{\text{mm.}}{10}$ .

The *mandibles* are horizontally slightly less than half the length of the céphalothorax. They have seven large teeth on inner margin of the falx-sheath and no intermediate. The *lip* is convex, somewhat broader than long, hollowed in front and without spines.

The *maxillæ* are straight in front, broadly rounded at base and profusely bespined over the whole basal area. The *sternum* is broadly oval, truncate in front, the posterior sigilla removed from the margin.

The *legs* are moderately stout, the tarsi of the front two pairs being scopulated and the metatarsi of the same partially so as well. On the third pair of tarsi is a faint indication of a scopula below the bristles. None of the tarsi are bespined, but all metatarsi and patellæ. The superior tarsal claws are pectinated in two rows with about seven to nine teeth in each. The superior claw is bare and very small. There are spines in a scopula on the metatarsal joint of the female palpi. The *abdomen* is oval, with thin downlying hairs and fine bristles on the upper surface.

The superior *spinnerets* are half the length of the céphalothorax, tapering, the first and third joints each about twice the length of the second. The inferior are  $1\frac{1}{2}$  diameters apart.

This species is easily distinguishable from *A. pallida* L. Koch, of which the front median eyes are also near together, by having no median or side stripes on the abdomen, and from my *A. grisea* by its much larger size, smaller rear eyes, and more compact eye-space, besides the falx-teeth, tarsal claws, and patellar spines.

One female from Table Cape, north coast of Tasmania, collected by Mr. Dove.

*Measurements in millimetres.*

		Long.	Broad.			
Cephalothorax ...	10	{ 5 in front. 8				
Abdomen .....	12		8			
Mandibles .....	$6\frac{1}{2}$					
„ .....	$4\frac{1}{2}$	horizontally.				
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.	
Legs .....	1.	5	9	9	8	= 31
	2.	$4\frac{1}{2}$	8	8	8	= $28\frac{1}{2}$
	3.	4	7	7	9	= 27
	4.	$4\frac{1}{2}$	9	9	10	= $32\frac{1}{2}$
Palpi .....		5	6	6	4	= 21
Superior spinnerets.....		2, 1, 2 = 5.				

## EXPLANATION OF PLATE XIII.

- Fig. 1. Eyes ( $\times 10$ ) of *Blakiston* *aurea*, ♂, p. 133.  
 2. " " " " ♀, p. 132.  
 3. " " *Aganippe pulleinei*, ♂, p. 128.  
 4. " " " " ♀.  
 5. " " " *laticr.*, p. 126.  
 6. " " " *subtristis*, p. 126.  
 7. " " " *smeatonii*, p. 126.  
 8. " " *Idiosoma sigillatum*, p. 125.  
 9. " " *Anidiops manstridgei*, p. 125.  
 10. " " *Dyarcyops andrewsi*, p. 130.  
 11. " " *Arbanitis gilliesii*, p. 125.  
 12. " " *Aname tasmanica*, p. 140.  
 13. " " *Chenistonia tepperi*, p. 137.

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June 17, 1902.

Prof. G. B. HOWES, D.Sc., LL.D., F.R.S., Vice-President,  
in the Chair

The Secretary read the following report on the additions to the Society's Menagerie during the month of May 1902:—

The registered additions to the Society's Menagerie during the month of May 1902 were 141 in number. Of these 26 were acquired by presentation and 64 by purchase, 6 were born in the Gardens, 44 were received on deposit, and 1 in exchange. The total number of departures during the same period, by death and removals, was 131.

Amongst the additions attention may be specially directed to:—

1. A fine example of the scarce and little-known Southern Anaconda (*Eunectes notatus* Cope) from Paraguay, deposited by the Hon. Walter Rothschild, F.Z.S., May 2nd, new to the Collection.

2. A female Hartebeest from Angola, acquired by purchase May 13th, apparently not different from the species of the Cape Colony, *Bubalis caama*.

3. Six Ruddy Flamingos (*Phoenicopterus ruber*) from Cuba, purchased May 29th.

4. Three American Bisons (*Bison americanus*) from the Woburn Herd, presented by the President of the Society, and received May 31st.

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Mr. Oscar Neumann exhibited some specimens of Monkeys (*Cercopithecus*) and Hyraxes (*Procavia*), belonging to species discovered during his recent journey through North-east Africa and during his earlier journey through German and British East Africa. Among the Hyraxes exhibited were examples of *Procavia erlangeri*, the black-headed Hyrax from Harar and the sources of the Wabbi, *Procavia matschiei* from the south coast of Lake Victoria, and *Procavia (Heterohyrax) thomasi* from Kaffa and

Gimirra, this being a true *Heterohyrax*, but living in the trees like a *Dendrohyrax*.

Mr. Neumann remarked that he could not quite agree with Mr. Thomas in uniting all the large-toothed Hyraxes of Abyssinia (except *P. scioana*) under the name *Procavia abyssinica* Hempr. & Ehr. This latter was a form with a variable black spot on the back, living in Bogosland and in the coast-region of Erythrea. *Hyrax alpini* Gray and *Hyrax irroratus* var. *luteogaster* Gray seemed to be synonyms of this species, both coming from Northern Abyssinia.

There was also a form with a small but distinct yellow spot on the back, which should bear the name *Procavia ferruginea* (Gray). The type of this species had been obtained by Jesse in Northern Abyssinia, and four specimens of it, collected by Blanford in Adigrat, were in the British Museum.

The form of large-toothed Hyrax, which Mr. Neumann had previously thought to be *Procavia alpini* Gray (Mitteil. Ges. naturf. Fr. 1901, p. 241), therefore, needed a new name, and he proposed to call it *Procavia meneliki*. It was similar to *Procavia mackinderi* Thos., from Kenia, but smaller, apparently lighter, and with a very large yellow spot on the back. The head was lighter, and the outsides of the hind legs were far lighter than in *P. mackinderi*. From *P. jacksoni* Thos., from Mau, which it resembled in size, it was also distinguishable by its lighter colour and much lighter underfur. There were likewise differences in the skull, which would be mentioned in another place. It was met with in Abuje and Badattino, Province of Gindeberat, south of the Blue Nile.

Another species of Hyrax new to science was *Procavia (Dendrohyrax) ruwenzorii*, similar to *Dendrohyrax stuhlmanni* Matsch., and to *Dendrohyrax crawshayi* Thos.; but differing from the former in the pale grey instead of black underfur, and from the latter in the absence of any reddish in the general coloration. It differed from both of them in the long and thick fur, which was the softest and thickest of all the Hyraxes as yet known, and in the exceptional amount of long and woolly hairs standing out beyond the other fur.

The only specimen of this new species, collected by Sir Harry Johnston, in September 1899, on Mount Ruwenzori at an altitude of 11,000–11,500 feet, was now in the British Museum (B. M. 1.8.9.43). It had been mentioned in Mr. Thomas's paper on the Johnston collection (P. Z. S. 1900, p. 178) under the name *Procavia crawshayi*.

The Monkeys exhibited by Mr. Neumann were *Cercopithecus hilgerti*, from the sources of the Wabbi; *Cercopithecus matschiei*, a very red form, from Kaffa; and *Cercopithecus djamdjamensis*, a mountain-form with very thick fur and a short tail, which lived at an altitude of from 10,000 to 12,000 feet in the bamboo-forests of Djamdjam, east of Lake Abaja. All these three species belonged to the *Chlorocebus* group.

Mr. Neumann also described a new species of the group of *C. albogularis* to which, at the suggestion of Mr. A. H. Neumann, the collector of the first specimen, he was glad to give the name *Cercopithecus kolbi*, in honour of Dr. George Kolb, the lamented German zoologist and explorer of the regions north-east of Mt. Kenia, who had been killed by a rhinoceros in 1899.

The following was the description of *C. kolbi*:—

♂. Similar in most respects to the dark mountain-form of *C. albogularis*, but with a pure white throat, which extends as a white half-collar round the neck, and leaves only a narrow space, about two inches wide, connecting the dark colour of the head with that of the back. The ears are thickly haired and pure white. The arms and hands are glossy black, the hind legs dark grey, the feet glossy black; the tail at the base is of the colour of the back, gradually passing into shining black towards the tip.

♀. Smaller, all the colours paler, head darker, the back more olive-brown, with less red; arms, hands, and hind feet paler black.

Five specimens of this species were in the British Museum.

The type (No. 0.1.31) had been obtained by C. S. Betton on the Kedong Escarpment, Sept. 21, 1899. Two other males had been procured by A. H. Neumann at 8000–9000 feet, on the east side of Mt. Kenia, and by Lord Delamere in Roromo, British East Africa. Two females had been obtained by Mackinder in the Nairobi forest on July 14, 1899. This species seemed to be restricted to Mt. Kenia and to the neighbouring mountain-chains.

*Cercopithecus albotorquatus* of Thomas, with which this Monkey had been confounded, was distinguished by its shorter fur—being probably a lowland form,—by the absence of the striking white colour of the ears, by its red anal region and base of the tail, by its reddish hind legs, and by the very sharp definition of the dark and white areas on the neck.

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Mr. R. I. Pocock, F.Z.S., exhibited and made remarks upon the nest of a Gregarious Spider (*Stegodyphus dumicola*), sent home by Capt. Barrett-Hamilton, F.Z.S., from Vredefort Road, Orange River Colony, S. Africa.

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A communication from Mr. H. J. Elwes, F.R.S., F.Z.S., called attention to the supposed new species of Elk from Siberia, published in the Society's 'Proceedings' for 1902 (vol. i. p. 207) and proposed to be called *Alces bedfordiae*, no exact locality being given. Mr. Elwes stated that when he was in the Altai Mountains, three years ago, he had procured from Lake Teletskoi the skull and horns of an Elk which were so exactly of the character of those found in European Russia, that he could not distinguish them. They were well palmated with about twelve points on each side. Mr. Elwes was convinced that though there might be many local



variations in the Elk in various parts of Siberia, it was most unwise to assume on such slight evidence that non-palmation was a constant character of even subspecific value.

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The following papers were read :—

1. Certain Habits of Animals traced in the Arrangement of their Hair. By WALTER KIDD, M.D., F.Z.S.

[Received May 15, 1902.]

(Text-figures 28–31.)

The subject now considered is limited by two conditions—first, that only mammals with somewhat short hair can be studied; and, secondly, that only two groups of habits are of sufficient prevalence to bear upon the question.

The bulk of the animals to be dealt with belong to the two great orders of Ungulates and Carnivores. A few Simiadae will be referred to, but other short-haired animals, such as Marsupials and Rodents, do not lend themselves to this form of study.

Certain of the habits common to all animals are divided into Passive and Active. The former include those concerned with the recumbent and the sitting positions, and the latter mainly those of locomotion, with a few subordinate ones.

I. *Passive.* (a) *Recumbent Position.*—The Ungulate, of which one of the Bovidae may be taken as a type, adopts as its normal attitude in rest only that of lying prone; and such an animal lies with head raised, either at or above the level of its trunk, fore-limbs doubled so that the carpal joint is completely flexed, the hoof of one side slightly everted, and that of the other, as a rule, under the abdomen. The posterior portion of the thorax and the abdomen rest on the ground, but the pectoral region is raised by the fore-limbs so as not to be in contact with it. The hinder portion of the body of the Ungulate seldom lies in the median plane, but inclined to one side or the other, so that the lumbar and lower dorsal portions of the spine are rotated, and this causes the hind-limbs to be on one side, the metatarsal bones extended and in contact with the ground, the “knee” of the animal strongly flexed and closely applied to the inguinal region.

In the attitude of complete rest, during sleep, the Ungulate seems to lie in no constant attitude, stretched out on one or other side.

A typical and predominant attitude adopted by Carnivores in lying is that the animal, *e.g.* a fox-terrier, when in a state of partial rest, lies with its head elevated; or in complete rest, with head reposing on the fore-limbs, the ventral surface of the muzzle in contact with the flexor surface of the radius and ulna. The fore-limbs, in the case of the Carnivores, are planted in an



extended position, in marked contrast with the flexed one of the Ungulates. Thus it happens that the extensor surface of the Carnivore fore-limb lies on the ground, the corresponding surface of the Ungulate being in contact with the flexor surface of the metacarpus. There are occasions when a Carnivore, such as a domestic cat or dog, doubles up its fore-limb and lies as an Ungulate does; but this is far from the common habit, and the limb being relatively short, the surfaces in contact are not large.

This predominant habit of the Carnivores brings to pass a close contact of the flexor surface of the radius and ulna of each side with the pectoral region. Passing backwards, we find that the projecting thorax and upper part of the abdomen are in contact with the supporting surface, as in the case of the Ungulate. The hinder portion of the Carnivore shows much the same attitude as the Ungulate, but it is rather less rotated, and frequently the hind-limbs lie extended under the abdomen in the long axis of the trunk.

(b) It is hardly too much to say that an Ungulate never sits, and that, in the case of the Carnivores, this attitude in rest is only found with any frequency in the short-bodied forms. In illustration of this, one may point out that it is hardly to be conceived that a horse, ox, or deer could sit, and that, to take examples among domesticated Canidæ, a dachshund comparatively seldom sits, and that a fox-terrier or pug spends a large proportion of its time in a sitting posture. Such facts are of course explicable on purely mechanical principles.

As to the ætiology of the difference of attitudes adopted by the Carnivores and Ungulates, the general shape of the different types will to a great extent account for it. The Ungulate forms, generally speaking, have a short body, long legs, very sloping humerus in standing, and a very strong ligamentum nuchæ; whereas the Carnivore forms have a relatively long body and short legs, humerus more nearly vertical than that of the Ungulate, and an unimportant ligamentum nuchæ.

Of these divergent modifications of forms, I would suggest that the presence of a powerful and efficient suspensory ligament in long-necked Ungulates, attached to the neural spines of the cervical vertebræ, and to the heavy large head, which in many forms bears the additional weight of antlers, is the factor which mainly determines the Ungulate attitude. This ligament of course allows the Ungulate to maintain the level or elevated position of its head without muscular effort—a position which is greatly more adapted to the general shape of the fore-quarter and the “set” of the head of Ungulates than that of the Carnivore, with the under surface of the lower jaw resting on the ground. The ligamentum nuchæ of the Ungulate allows the centre of gravity of the heavy Ungulate fore-end to be thrown further back than is possible with the Carnivore. The effect of the Carnivore’s attitude is to produce a forward slide of the fore-end on the extensor surface of the radius and ulna, where the subcutaneous

tissue is very loose, a slide which obviously is impossible in the strongly-flexed position of the corresponding joint of the Ungulate.

Among Simiadæ numerous groups adopt a corresponding habitual attitude of the forearm; and in Man the habit of resting this surface against supporting objects is very common, producing in both cases a similar forward slide.

II. *Active Habits*.—The most noticeable active habits of animals are those of locomotion. A few other habits, of a more varying character and less constantly present, will be noted under the different areas involved by them. The habits of locomotion vary in all degrees, from the short step and slow walk of a domestic ass to the amble of a horse, the quick, short trot of an ass, the full trot, canter, and gallop of a horse or other large Ungulate. The locomotive habits of the Carnivores are not so noteworthy, and their greater development of the fore-quarters than of the hind-quarters is noteworthy, the fore-limb being largely modified as a weapon of offence in addition to its locomotive function. The various animals which are now under consideration, with the exception of the Domestic Horse, exercise their locomotive powers according to their *own* needs. The Horse and its congeners, the Ass and Mule, stand alone in this respect; the Horse most conspicuously so, for this animal has been produced by man for locomotion just as much, though by different methods, as a locomotive engine has been produced—in each case for the benefit of man himself. The Horse has no other *raison d'être*. In this view, then, the Domestic Horse should be the most profitable of all animals for study under this division of the subject, and it is found to be so.

HAIR-DIRECTION.—The foregoing habits of animals, passive and active, are closely related to and shown by certain directions of their hairy coverings, and the latter often point out very clearly both what the animals have done and what they have not done. The direction of the hair may be loosely compared to a cinematograph representation of the life of the animal possessing it.

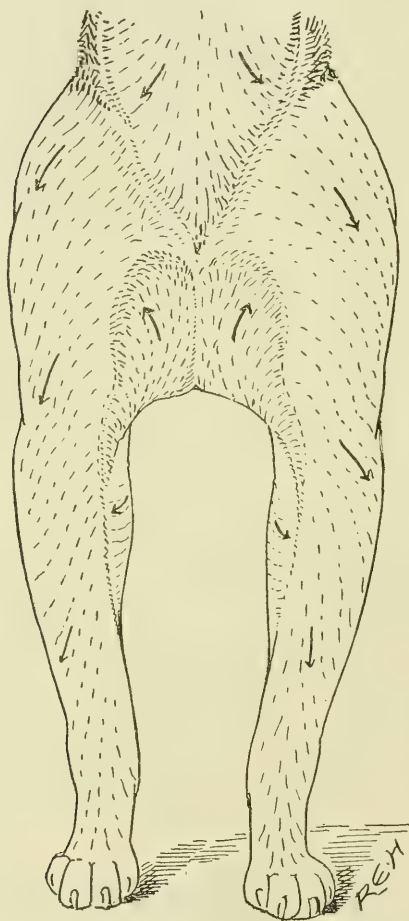
A. *Passive Habits*.—The passive habits of an animal in sitting and lying are necessarily shown mainly on the ventral surface of the body. The traces of their habits will be looked for in (1st) the pectoral region, (2nd) the fore-limb, (3rd) the abdomen, (4th) the extensor surface of the hind-limbs, (5th) the gluteal region.

(1) In the *Pectoral region* among Carnivores there is seen a marked impression, which corresponds with the pressure of the flexor surface of the fore-limb as far as this comes in contact with it in lying; and the result is that an area of hair is directed forwards against the general stream of the chest (text-fig. 28, p. 148). This is well shown in an ancient sculpture of two Molossian hounds in the Capitol Museum in Rome. In Ungulates this reversed area of hair is also common, but numerous exceptions have been shown to exist<sup>1</sup>. In the Domestic Horse this pectoral arrangement is more

<sup>1</sup> Proc. Zool. Soc. 1900, p. 686.

marked than in any other animal and quite constant; and it is probable that in this instance the arrangement of hair has a different mechanical cause, namely, a dynamical one. The attitude of the horse in rest does not lend itself markedly to the

Text-fig. 28.



Dog, showing the opposing hair-streams on the chest.

production of this arrangement; but the constantly locomotive life of the horse does afford adequate reason for a reverse direction of the hair-stream by means of strongly divergent traction of underlying muscles. It is interesting to compare this

whorl, feathering, and crest of the pectoral region of a Horse with what is found in the closely-allied Ass and Mule. In the Horse it is large, symmetrical, never absent, especially marked in high-stepping horses, whether cart-horses, or horses selected because of their high action in trotting. Its size, indeed, is a measure of the activity of the pectoral muscles and flexors of the fore-limb. In the Ass it is either absent (and this is the rule) or, when present, it is rudimentary; in the Mule it is more frequently present than in the Ass but still rudimentary. These degrees of development of the pectoral whorl, feathering, and crest in Horse, Ass, and Mule correspond closely with the locomotive habits of the three animals.

In the six Prejevalsky's Wild Horses in the Society's Gardens it is also absent, as one would expect in a wild animal. In Zebras and *Equus asinus*, though so closely allied in form to the Horse, but so unlike in their wild and *independently* locomotive life, it is absent.

(2) On the *Fore-limb* the two types of arrangement of hair have been fully described<sup>1</sup> elsewhere, and it is only necessary to point out here their relation to the two main recumbent attitudes, those of the Carnivore and the Ungulate; the exceptions found among the latter have been given elsewhere<sup>2</sup>.

(3) *Abdomen*.—The ventral surface of the thorax and abdomen show little interference with the normal slope of the animal's hair caused by its attitudes in lying. It is perhaps not unnecessary to point out this fact, because in such a study negative facts may weigh considerably in support of a positive contention if explanations in accordance with these be forthcoming. When lying on the ventral surface of its abdomen, an animal rests very little on the thorax because of the support of the fore-limbs; and in this position any tendency to slide forwards which may exist serves but to confirm the normal slope of hair from cephalic to caudal extremity, and thus the absence of any marks on the ventral surface, due to the recumbent position, is fully accounted for.

On the lateral aspect of the abdomen there is found in nearly all Carnivores and Ungulates an area of reversed hair, where the "knee" of the animal rests in flexion, during lying and sitting, against the flank. The extent of this area is variable and is usually marked off by a margin, showing where the general backward and downward direction of hair on the flank is interrupted by the pressure of the flexed hind-limbs. In many animals, there is a general forward slope of the hair on the hypogastric region till it reaches a point on the abdomen where apparently the effect of the pressure of the hind-limbs ceases, and at this point a tuft is often seen, especially in horses. It is shaped very much like a small stack of corn, and stands out from the rest of the surrounding hair. I have seen a definite ridge with two tufts at the meeting-place of the stream of hair from the thorax and

<sup>1</sup> 'Use-Inheritance,' A. & C. Black, 1901, pp. 28, 29.

<sup>2</sup> Proc. Zool. Soc. 1900, p. 686.

abdomen with that which passes forwards from the inguinal region; and such hereditary tufts are most difficult to account for, except on the supposition that the slowly-growing trunk-stream is opposed and interrupted by the reverse action of the flexed hind-limbs in the recumbent position, pressing against the flank.

(4) The *Gluteal* region is the only one where the posture of sitting is indicated in the arrangement of hair (text-fig. 29). It is obvious

Text-fig. 29.



Dog, showing the whorl (A) on the gluteal region and hair-streams on the extensor aspect of the thigh.

that, except for pressure on the digits of the fore-feet and on the metatarsal bones, there is no point of contact of the body with the ground, except the tubera ischii. Here is the very spot in animals, accustomed much to the sitting posture, where a whorl lies exactly over the tuber ischii of each side; and it is a breach of



the "law of parsimony" to look for any other cause of this whorl than the pressure of the weight of the animal's body on the hair over this prominent region.

In almost all the Carnivores and Ungulates, the hair on the gluteal region curves over this rounded surface, taking a course in the long axis of the limb itself, as in a horse, or very often in the long axis of the trunk, as may be seen in a short-haired dog. The sweep of this gluteal stream towards the perineum is interrupted by the whorl mentioned, in a few animals which sit, such as short-haired dogs and many of the Simiidae, though in most of the latter it is rather a bare area or callosity than a whorl—but equally significant as to causation. In all such Ungulates as Bovidae, Equidae, Cervidae, Ovidae, *Capra*, Tapiridae, and in Felidae, Ursidae, and most wild Canidae—animals in which the sitting posture is either impossible, inconvenient, or little adopted—it is conspicuous by its absence.

(5) The posterior or extensor aspect of the *Femoral* region in many animals shows on its inner half the marks of pressure against the ground, in a reversed slope of hair which passes upwards and outwards to meet the downward and inward slope of the stream coming from the outer half of this limb-segment.

B. *Active Habits*.—The effects on the arrangement of hair of animals produced by active habits are shown mainly in the formation of whorls at certain critical points, with their associated featherings terminating in crests or ridges. The greater or less activity of locomotion is the most important fact about an animal in this respect; but three regions of the body present whorls which are not directly connected with locomotion, and these may be considered first. They are the *Nasal*, *Frontal*, and *Spinal* regions.

On the *Nasal* region the slope of hair varies in a remarkable degree in different animals, and has been considered elsewhere<sup>1</sup>. It is therefore only necessary to remark here that a nasal whorl and commencement of feathering is found very constantly close to the muzzles of those animals with long, pointed snouts, such as Canidae and Cervidae, and that in such as Felidae, with broader snouts, it is found at the level of the orbits. Thus the slope of hair on the nasal region in the former is from snout to orbit, and on the latter from orbit to snout. This is obviously not a mere unaccountable correlation of facts, but a mechanical result of the shape and *pose* of the head, which thus confers on the narrow snout a backward, and the broad snout a forward and downward trend of hair, owing to constant friction in their respective directions. That this differing direction of hair is an adaptive modification produced for the benefit of the animal, cannot be seriously maintained.

In Tapirs the bilateral nasal whorl is situated in a very suggestive position, just where the large projecting snout begins to curve downwards.

<sup>1</sup> Proc. Zool. Soc. 1900, pp. 677-680.

*Frontal*.—The arrangement of hair here need not be stated at any length; it is sufficient to point out that a whorl is found at very different levels in varying forms of head, from a position low down almost on the nasal region, in the Domestic Ass, to a point near the level of the external ears, as in certain Bovidæ. A tolerably constant fact connected with it is that from it proceeds a feathering, which passes towards the ears and terminates in a crest. In this instance, as in others, the whorl indicates the commencement, and the crest the cessation of a very persistent and strong muscular action common to the life of the animal, effectively leaving an indelible mark on the hairy covering. This frontal whorl lies just over a group of muscles whose fibres pull in very divergent directions; and the crest is situated where the effect of the traction of the former muscles becomes neutralized by the opposing temporal muscles. The particular animal habit, indicated by these arrangements of hair, is most probably associated with the incessant action during numerous hours of the day spent, on the one hand, by the animal in feeding and cropping herbage, and on the other in active locomotion. All of these actions tend to employ powerfully the maxillaris muscle, or levator labii superioris et alæ nasi, which in the former raises the upper lip, and in the latter dilates the nostril. These actions of the maxillaris muscle are best observed in the browsing habits of Oxen and the locomotive habits of the Horse. Again, the Domestic Horse is useful for study in this matter, for its preponderating activity of locomotion agrees with the fact that this frontal whorl is more marked and persistent than in any other animal.

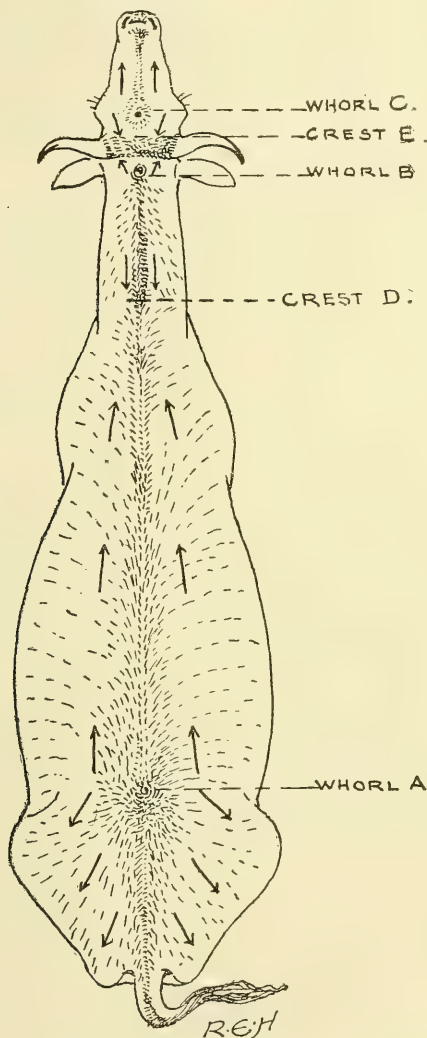
In the Horse this frontal whorl lies at the level of the orbits in the majority of cases; in the Domestic Ass so low down as to be on the nasal region as a rule; in the Mule it is situated midway between the positions of the Horse and Ass.

In all Zebras examined it has been found that the frontal whorl feathering and crest are singularly ill-developed, and even often absent. This difference in an animal so similar in form to a horse is peculiar, and probably is connected with the fact that though Zebras are capable of very active locomotion, they differ very materially from Horses in the general character of their lives, not being incessantly occupied in locomotion on behalf of man as the domestic horse has been since it was domesticated. Thus in wild Equidæ one very important action of the maxillaris muscle is *occasional* and much less strong than in the horse, and is also less strong than in the ass and mule.

The *Spinal* region in the middle line shows in the hair of certain animals, chiefly Ungulates, very varying results of their varying habits; and the simplest instance of these arrangements is to be seen in the view from above of the back of an Ox, or preferably a calf (text-fig. 30, p. 153), the young animal showing the points more clearly. In this view the parietal region of the extended head may also be examined. In the frontal region is seen the frontal

whorl—this is produced into a *feathering* which terminates in a *crest* just below the level of the horns. From this crest the

Text-fig. 30.



Domestic Ox (young): opposing hair-streams and whorls, seen from above.  
A, B, C, whorls; D, E, crests.

hair-stream passes backwards to a whorl below the ears. At the middle or posterior third of the neck, the backward stream of

the neck from this whorl is met by a forward stream, and a *crest* is produced by the two opposing streams. The forward stream from the trunk is a feathering which starts from a whorl situated about the middle of the dorsal region. In this view of the median plane there are seen three whorls, two crests, and at each of the latter two opposing streams of hair.

It seems hardly possible that these arrangements of hair and reversed slope in two separate areas can be connected with any other cause than muscular action, especially that of the panniculus carnosus, whose fibres here lie nearly in the long axis of the trunk with a slightly downward direction. It corresponds with the arrangements found on the back of other forms, such as the Lion, certain Antelopes, Bovidæ; and some with longitudinal and central crests or manes, as in *Connochaetes* and *Oreas canna*.

Whorls and forward featherings in the spinal region are not very common, and would appear to be determined by the activity of the panniculus carnosus employed in defence of the animal against flies and various insects. This function is also subserved by the tail, so that an animal possessing an efficient tail, and presenting, in a spinal whorl and feathering, the evidence of a very active "fly-shaker," as it is popularly called, is well adapted for existing in areas where flies abound. It is worth noting that such animals as Cervidæ, Ovidæ, *Capra*, Gazelles, with few exceptions, present neither efficient tails nor this particular evidence in the hair of a very active "fly-shaker," but that many of the larger Antelopes, true Oxen, and Giraffes present both efficient tails and evidence of activity of this superficial muscle in whorls, featherings, and longitudinal crests or manes. Some of the most marked instances of spinal whorls and manes have been studied, and measurements taken from the root of the tail to the tip, and from the same point to the situation of the spinal whorl. These measurements of 17 species and 29 specimens are given, by which it is shown that animals which possess well-developed manes and spinal whorls and featherings also possess efficient tails, though the distance between the root and tip of tail, and root of tail and whorl or end of mane, in some forms, does not correspond closely, which one would hardly expect.

The species examined and the measurements were as follows:—

	From root to tip of tail.	From root of tail to spinal whorl or end of mane.
<i>Connochaetes gnu</i> .....	32 inches.	29 inches.
" <i>taurinus</i> .....	24   "	28   "
<i>Oryx gazella</i> (2 specimens) .....	{ 30   "	14   "
	{ 31   "	14   "
" <i>beisa</i> (2 specimens) .....	{ 26   "	15   "
	{ 25   "	12½   "
<i>Hippotragus niger</i> .....	20   "	38   "
" <i>equinus</i> .....	25   "	36   "
<i>Oryx beatrix</i> .....	17   "	10   "

	From root to tip of tail.	From root of tail to spinal whorl or end of mane.
<i>Cobus unctuosus</i> .....	15 inches.	18 inches.
„ <i>kob</i> .....	12 „	23 „
„ <i>leche</i> (3 specimens).....	12 „	25 „
	9 „	15 „
	9 „	15 „
	10½ „	19 „
„ <i>senegamus</i> (3 specimens) .	8½ „	16½ „
	9 „	12½ „
	9½ „	15 „
„ <i>vardoni</i> (3 specimens) ...	9 „	19 „
	5½ „	8 „
	9½ „	15 „
„ <i>thomasi</i> (2 specimens) ...	13 „	20 „
„ <i>leucotis</i> .....	7 „	13 „
<i>Cervicapra arundinum</i> (3 speci-	19 „	14 „
mens) {	12 „	17 „
	12 „	20 „
„ <i>fulvo-rufola</i> (2 speci-	9 „	15 „
mens) {	8 „	12 „ (young)
<i>Felis leo</i> .....	37 „	20 „

In the (1) *cervical*, (2) *pectoral*, (3) *post-humeral* or *axillary*, and (4) *inguinal* regions, the changes of hair-slope consequent upon habits of active locomotion are most evident.

(1) In the lateral and ventral aspects of the neck, whorls are frequently seen in the Horse and seldom in other animals, and these are less uniform in position and degree of development than in other regions. In the strongly-developed muscular neck of a horse, they appear very frequently between the sterno-mastoid and splenius, or the sterno-mastoid and sterno-hyoid, and in the middle line of the ventral surface. *Felis leo* and *F. pardus* show very marked whorl and feathering on the side of the neck, probably from the strongly acting panniculus carnosus.

(2) The pectoral area is one of the "critical areas" from this dynamical point of view; and many animals exhibit here marked signs of the degree and range of their locomotive activity in more or less persistent whorls, feathering, and crests, lying over the situation where the strong and important pectoral and flexor muscles of the fore-limb diverge. It is unnecessary to mention in detail the various animals in which these appear more or less markedly<sup>1</sup>; but the cases of the Horse, Ass, and Mule may be more particularly considered, as bearing on the position here maintained, namely, that the range, degree, and constancy of muscular habit in the life-history of a species is portrayed in the hairy covering in certain parts of their bodies, where this is possible.

<sup>1</sup> See 'Use-Inheritance,' A. & C. Black, 1901, pp. 18, 19.



In the Horse a marked whorl, feathering, and crest are never absent from the pectoral region; a specimen that failed to show this would be an abnormality, and the arrangement peculiar to the horse is not only constantly present, but varies in width, length, and definition, according to the muscular development of the great masses of pectoral muscle, which are so active in flexion of the "elbow" of the animal. Indeed, it is roughly possible to determine by this criterion in individual cases whether this or that specimen and its immediate ancestors were high-stepping animals or the reverse.

The difference between the wide and long whorl, feathering, and crest on the pectoral region of a high-stepping, muscular English cart-horse, and the narrow, ill-developed arrangement, resembling that of a mule, on the corresponding part of a small, ill-bred, shambling hackney, such as are very common in Italy, is very striking in illustration of this point.

In the Domestic Ass, with its small pectoral development and short step, the whorl, feathering, and crest are seldom present at all, and most variable and rudimentary when they are present.

In the Mule, with somewhat stronger muscle and higher action, and yet in both respects far inferior to the Horse, the whorl, feathering, and crest are more marked and more often present than in the Ass.

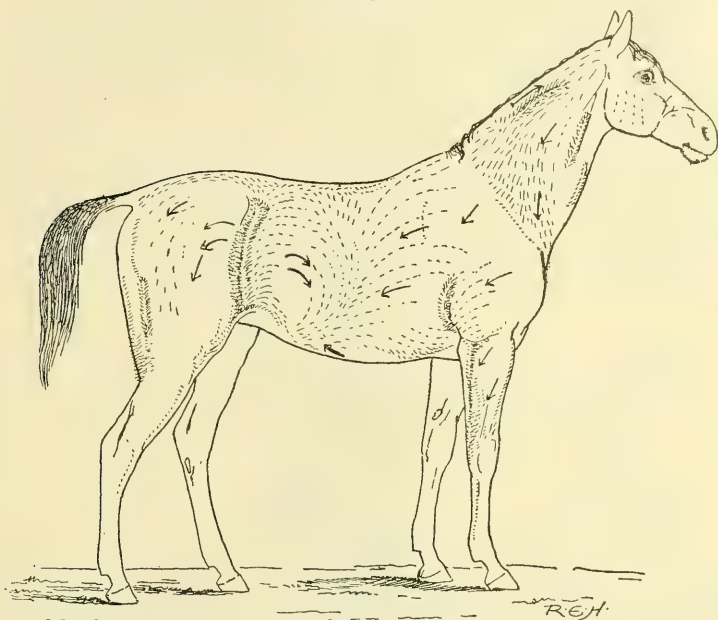
(3) The *post-humeral* or *axillary* region occasionally furnishes evidence of the locomotive activity of the animal and its ancestors; but the whorl, feathering, and crests found here are never constant in a large number of specimens and even in horses are rare, not more than 2 per cent. of our domestic horses showing it.

(4) In the *inguinal* hollow of many animals there are marked traces of their personal and ancestral activity. In the Horse, the well-known appearance of a graceful feathering, starting from a whorl at the inguinal fold of skin and passing up to a marked ridge at the level of the crest of the ilium, is as constant as the corresponding phenomenon in the pectoral area (text-fig. 31, p. 157). Here, again, a horse that did not present this feature would be an abnormality. It varies, as any other character may, in degree and fulness of development, and is an evidence of a certain portion of the anatomy and modern life-history of the species. The comparative anatomy of this arrangement has been elsewhere<sup>1</sup> more fully treated, and it is unnecessary now to allude to this, except in the case of the Horse, Ass, and Mule. In the Horse it is constant, well-developed, and the length of the feathering is never less than half the distance between the margin of the inguinal fold of skin and the crest of the ilium. In the Mule it is constant, but never larger than this minimum development of the horse; and in the Ass seldom present, and, when present, it is but a circular small whorl without any definite feathering or crest, and is situated at the centre of the ilio-inguinal hollow.

<sup>1</sup> P. Z. S. 1900, p. 686.

These degrees of development in three familiar animals are suggestive as to the well-known differences in their locomotive activity.

Text-fig. 31.



Domestic Horse, showing the hair-streams, feathering, and whorls.

It may be remarked that the Prejevalsky's Horses in the Society's Gardens exhibit small whorls, featherings, and crests, more like those occasionally found in the Ass than those of a Mule or Horse, and that no Zebras of the various species examined show any-traces of this arrangement of hair; also that *Equus onager*, in the Society's Gardens, alone shows a large whorl, feathering, and crest, like those of a Mule, but wider and better developed.

One may now ask, after the review of these evidences as to the connection of the habits of animals with arrangements of hair, whether it is not shown that they carry about them clear traces of their habits, passive and active, which are peculiar to them and to a long line of ancestors.

In this view, whorls, featherings, and crests may be looked upon as by-products of muscular activity. If this be allowed, it is highly instructive to note what muscular activity is capable of doing, as to modifying the direction of hair, a structure itself not concerned in muscular action; and it is not less important from the point of view of inheritance to note that very long-continued

and constant pressure of harness, an influence not connected with the vital actions of the animal concerned, is incapable of producing any similar effects. The latter is fully in accord with the extensive study and negative results of the supposed inherited effects of mutilations.

Mr. Lydekker has pointed out the interesting opinion of Darwin, that the habit, displayed by domestic horses, of clearing away the snow from their pasture in winter by scraping with their front hoofs, indicates that the original habitat of the species was in regions where the ground is covered during a portion of the year with snow, so that this trait of the domestic horse, as we know it, would be looked upon as vestigial. In reference to many of the varieties of hair-arrangement here given in detail, it is hardly a less legitimate inference to hold that they present an epitome of long-continued and oft-repeated muscular activities in the line of ancestry involved, though themselves of no importance.

2. On the Carpal Organ in the Female *Hapalemur griseus*.  
By FRANK E. BEDDARD, F.R.S., Vice-Secretary and  
Prosecutor of the Society.

[Received June 3, 1902.]

(Text-figures 32-35.)

Some years ago<sup>1</sup> I described and figured in the male *Hapalemur griseus* a patch of spine-like structures upon the forearm close to the wrist, which was associated with a gland lying beneath the integument of "about the size and shape of an almond." I figured this patch as lying just behind the wrist and separated from the callous integument of the palmar surface of the hand by a region covered with the ordinary body-fur. Later<sup>2</sup>, this same structure was again recognized by Mr. Bland-Sutton and figured by him. Still later, I found myself able to add some further details with the help of a second specimen of a male of this Lemur<sup>3</sup>. I have not been able until the present time to examine a female of this species. Until this year, all the examples of this species acquired by the Society appear to have been males. But the death of a female example in May of this year enables me to complete the examination of this novel organ, by studying its characters in the female. I may remark, in the first place, that in my earliest paper upon *Hapalemur* I was able to quote from the late Prof. A. Milne-Edwards and from Dr. Jentink information to the effect that the patch of spines is not present in the female, but appeared to be represented by a tract of modified skin. Since then the arm of this species of Lemur has been figured by

<sup>1</sup> "On some Points in the Structure of *Hapalemur griseus*," P. Z. S. 1884, p. 391.

<sup>2</sup> "On the Arm-gland of the Lemurs," *ibid.* 1887, p. 369.

<sup>3</sup> "Additional Notes upon *Hapalemur griseus*," *ibid.* 1891, p. 449.

M. Milne-Edwards<sup>1</sup>; but the drawings which I herewith submit to the Society show rather more plainly certain points to which I now desire to call attention. At first sight the patch of integument in the female seems to present several differences of importance from the corresponding structure in the male animal. But the differences are not quite so great as might appear,

Text-fig. 32.



Lower surface of hand of *Hapalemur griseus*, ♂.

A, callous pad overlying arm-gland; B, patch of spines; C, tuft of long hair.  
(From P. Z. S. 1891, p. 450.)

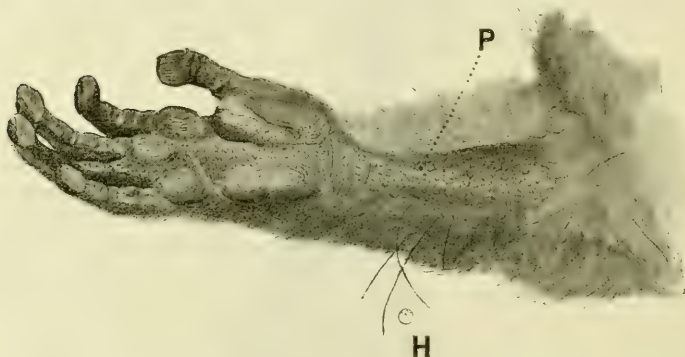
particularly if a dried skin only were examined. The callous patch extends for a distance of about two inches up the arm; on the wristward side it is continuous with the integument of the hand. This, it will be remembered, is also the case with the male,

<sup>1</sup> Histoire naturelle &c. de Madagascar, Mamm. Atlas, pl. 122 z. It is not quite clear whether the male or the female is intended; the illustration is a reproduction of a photograph and is not very good. In any case there are only two figures, one of the ventral and the other of the dorsal surface of the hand of the animal, and, presumably, the same hand. The corresponding text has not yet appeared.

though in my original figure I represented the patch of spines as ceasing some little way in front of the wrist—as was indeed the case with the specimen examined. The greater or less extent of the patch may be a question of age.

But in the second specimen examined by myself (text-fig. 32, p. 159) the patch of spines was quite continuous with the integument covering the palm of the hand. The patch, moreover, was not entirely covered with the longish, squarish, spine-like outgrowths; a small tract immediately covering the gland was covered with thickened and horny integument, but of a nature more resembling that upon the palm of the hand. In the female, as the accompanying drawing shows well (text-fig. 33), the tract of skin is of quite the same shape as that occurring in the male. But it is uniformly covered with low elevations of a rounded contour which are precisely like those which cover the palm of the hand, except upon the “balls” of the fingers, where the integument is marked

Text-fig. 33.<sup>2</sup>



Palmar surface of hand and forearm of *Haplemur griseus*, ♀.

H, carpal vibrissæ; P, horny patch.

with fine concentric grooves. The patch in fact appears to be merely an extension backwards of the callous integument of the palm of the hand. This is exactly the same thing that is met with in *Lemur catta*<sup>1</sup>. So far, therefore, there is a correspondence in the two sexes of *Haplemur griseus*. And in reality the likeness goes still deeper. The spine-like outgrowths of the male are in all probability quite comparable to structures which I have lately described in the hind foot of *Galago garnetti*<sup>2</sup>. In this animal, a microscopical investigation of the spines shows that they are merely columnar outgrowths of the horny layer of the integument, and not special structures peculiar to the Lemur. They

<sup>1</sup> Bland-Sutton, *loc. cit.* p. 370, fig. 2., & p. 371, fig. 3.

<sup>2</sup> P. Z. S. 1901, vol. i. p. 271.

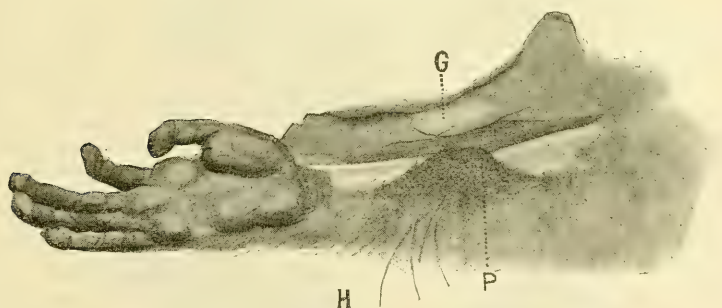


are simply intensified callous papillæ. I see no reason to doubt their histological similarity in *Hapalemur*, though I cannot from my own observations upon the actual specimens state this with absolute certainty. In this case, therefore, the male *Hapalemur griseus* is not characterized by any structure peculiar to its sex, but merely shows an exaggeration of the characters found in the female, a constant state of affairs in the secondary sexual characters of animals. If the elevations upon the carpal organ of the female were much increased, the characters of the male would be produced; and it will be remembered that a portion of the tract of integument in the male has preserved, at least in one specimen which I described, the characters of the integument in the female. The drawing to which I have referred shows also that the carpal vibrissæ are present in the female as well as in the male. It is but rarely that these hairs are absent in one sex and present in the other of a given species<sup>1</sup>.

With regard to the external structure of the arm in this Lemur, I may finally observe that the naked patch of thickened integument is not absolutely devoid of ordinary hairs. In transverse sections a few of these are apparent. Here again we have a less modified state of affairs in the female than in the male.

In the male *Hapalemur griseus* I described the naked-eye characters only of a peculiar gland underlying the tract of modified

Text-fig. 34.

Palmar surface of hand and forearm of *Hapalemur griseus*, ♀.

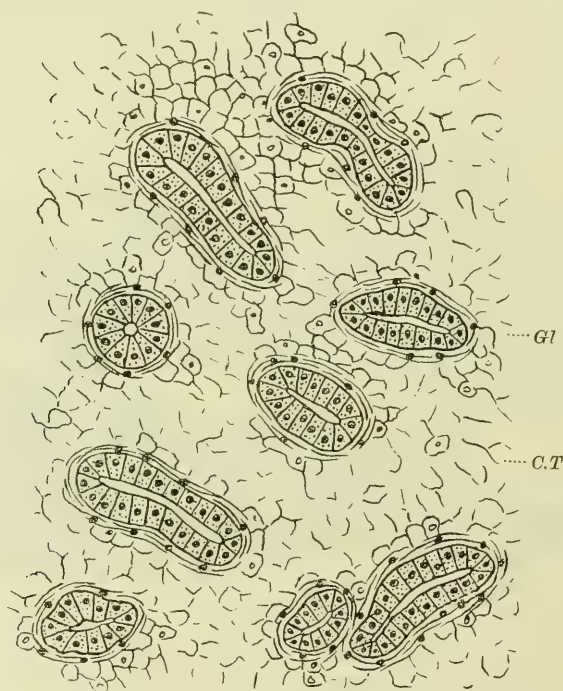
The integument is reflected to show gland (G); other letters as in text-fig. 33.

skin upon the arm. This gland was of a white colour and very conspicuous, lying immediately below the skin. I find that the female animal has precisely the same kind of gland (text-fig. 34), occupying the same position. It underlies, in fact, the callous integument.

<sup>1</sup> Beddard, "Observations upon the Carpal Vibrissæ in Mammals," P. Z. S. 1902, vol. i. p. 127.

It is of about three-quarters of an inch in length and less than half an inch in width, of an oval contour and white colour. Were it not for its regular shape and the lean condition of the animal, I should perhaps have put down this gland for a piece of fat, to which it bears a striking resemblance in general appearance and also in texture and "feel." It is very soft and could be readily scraped away; it was difficult to dissect it away cleanly from the skin before the whole area had been hardened in spirit. The reason for this resemblance to fat becomes plain when the tissue of the gland is examined microscopically. The accompanying drawing (text-fig. 35) shows a portion of a section through the

Text-fig. 35.



Transverse section through arm-gland of *Hapalemur griseus*. Highly magnified.  
C.T., connective tissue; Gl, glands.

gland, cut across the long axis. It will be observed that the chief portion of the gland is not formed of glandular tissue at all: it consists of a network of adenoid tissue which may very possibly here and there have held fat-cells in its meshes. It is extremely

like the reticular tissue of a lymphatic gland. The laxity of this tissue accounts for the fatty texture which the gland exhibited on dissection. Imbedded in this reticular mass are the tubes of the glands proper. The directions of these, as will be seen from the drawing referred to, is mainly across the short axis of the gland. They run, however, in various directions. The tubes are on the whole of much the same width throughout; but the calibre varies slightly from place to place. They are lined by a layer of low columnar epithelium, and outside of this is a layer of muscular fibres. The glandular tubes in fact conform to the plan of gland exhibited by the sweat-glands of mammals. They do not belong to the sebaceous type. The course is not straight or even approximately so; the glands are coiled in much the same way which characterizes other sudoriparous glands, and one can occasionally notice the characteristic undulations of these glands. I could not observe anywhere any evidence of the branching of the glands, and if it occurs it is at least not common; each separate tube appeared to be absolutely free of its neighbours. Nor could any common duct be observed by which the sum total of the separate glands opened on to the exterior. When a section across the arm-gland was examined by a low-power lens, the adenoid tissue was seen to be massed into strands lying to a considerable extent parallel like the leaves of a book; the direction of these strands was mainly in the same plane as the two lateral surfaces of the gland-mass and the two ends of the same. But the strands are not entirely unconnected with each other. A much thinner, laxer, tissue connected them to each other. But very frequently the thinness of this led to its being missed through injury or mere insignificance in a given section. It is in the thick plates only that the gland-tubes are to be seen; they do not occur in the much laxer between-tissue. The arm-gland, therefore, of this Lemur appears to present a possible stage in the evolution of a compound gland out of an aggregation of separate sudoriparous glands. It is very comparable to the milk-gland, only that that gland (save in the Monotremes) is an aggregation of sebaceous glands. If the laxer connective tissue lying between the thicker plates were to vanish, and the gland-tubes, being more closely approximated, acquire a connection with each other, a compound gland would result. The external appearance of the gland, as already stated, and as apparent in the drawing exhibited herewith (text-fig. 34, p. 161), is quite that of a compound gland, and does not at all suggest a merely close approximation of separate gland-tubes. The prevalence of the framework of the gland over the gland-tubes is a very striking feature of this arm-gland.

## 3. On a new Cœlomic Organ in an Earthworm.

By FRANK E. BEDDARD, M.A., F.R.S., and S. M. FEDARB.

[Received May 13, 1902.]

(Text-figures 36-39.)

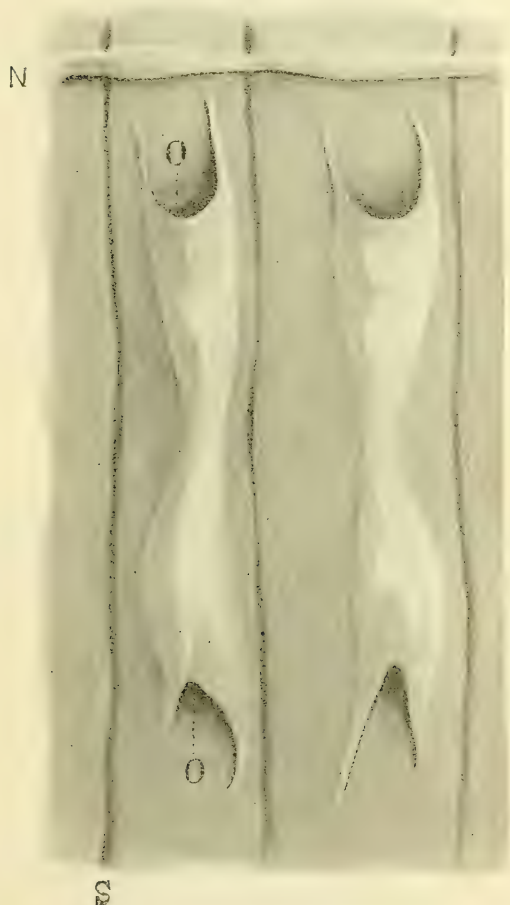
The following observations relate to *Pheretima* (*Perichaeta*) *posthuma*, and were made upon some well-preserved material from Calcutta which we owe to the kindness of Mr. F. Finn, F.Z.S., Deputy-Superintendent of the Indian Museum. In dissecting a number of these worms, a series of sac-like structures were plainly observable upon the floor of a certain number of segments in the middle of the body. The accompanying figure shows the general appearance of these when magnified by a hand-lens (text-fig. 36), from which it will be seen that the structures in question have the form of an hourglass, or a double cone with the bases of the two cones distant and their apices in contact. Ventrally, these sacs come near to the ventral nerve-cord; but dorsally they do not reach the opposite side of the body. They occupy in fact not more than a fourth or fifth of the total circumference of the body-wall. They are symmetrically disposed from segment to segment; that is to say, they occupy the same position exactly in consecutive segments. It is easy to see, merely with the use of a lens and a dissecting-needle, that these structures are cavities formed by a membrane, which is anteriorly and posteriorly, but not laterally, attached to the parietes of the body. A needle can be readily slipped under the sac at each end. They may be said, in fact, to end laterally by a wide funnel-shaped mouth, the corners of which, as is shown in the drawing already referred to, are somewhat drawn out so as to offer a firmer basis of attachment, like the ropes of a tent. In the middle, the surface of these chambers is quite convex upwards; and at the "waist," where the two cones join by their apices, there is a considerable narrowing marked by the passage of a strong blood-vessel. These cavities are, however, not equally marked in all the specimens of this earthworm which we dissected; they are much more conspicuous in some than in others. We thought it possible to detect a relation between them and the glands attached to the septa just above the intestine—those small and also apparently cœlomic structures which one of us has described in several species of this genus of earthworms<sup>1</sup>. Where the glands lying above the intestine were well developed, it appeared to us that the ventral cœlomic chambers were also particularly conspicuous.

We do not, however, venture to insist upon any special relation-ship between these two series of organs. These pouches do not run continuously through the body of the worm. They begin behind the spermiducal glands at about segment xxii., and are seen to increase gradually in size up to as far back as segment xl. For about twenty segments they are at their prime. After this point they get smaller and often irregular; but they extend right to

<sup>1</sup> Beddard, P. Z. S. 1890, p. 61 ("Glycogenic organs").

the posterior end of the body. There are then about twenty pairs of these chambers which are fully developed. In the regions of the body where they are feebly developed, the pouches present the appearance shown in the accompanying drawing

Text-fig. 36.



Coelomic pouches of *Pheretima posthuma*.

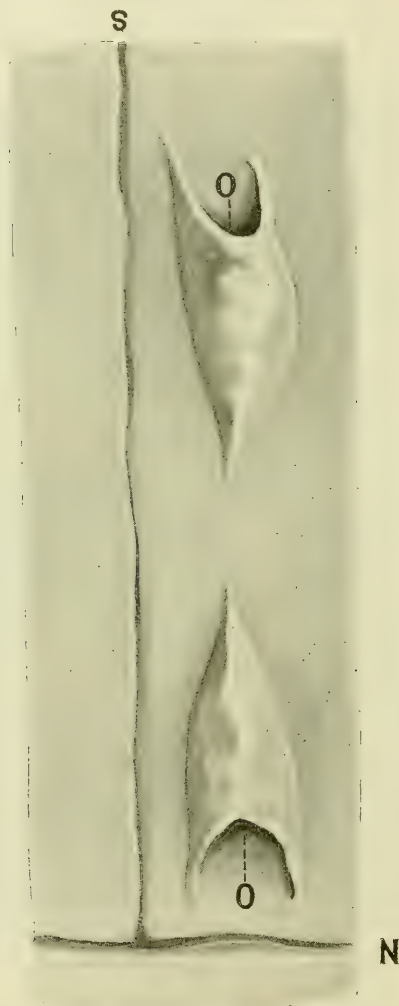
N, nerve-cord; O, orifices of pouches; S, intersegmental septum.

(text-fig. 37). The two halves have come apart—or, perhaps, rather have not joined—and where a single hourglass-shaped sac was to be seen are two smaller sacs of roughly conical form, separated by a considerable space. The fully developed sacs



measure 3 mm. from mouth to mouth, and their diameter is about 5 mm. This is all that we have to say respecting the naked-eye

Text-fig. 37.

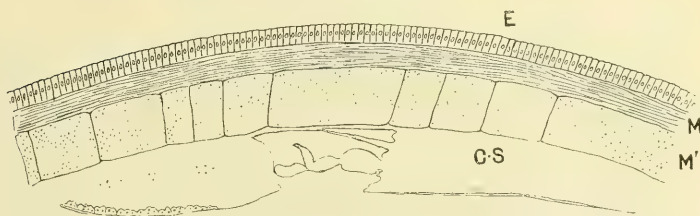


Imperfectly developed coelomic pouches of *Pheretima posthuma*.  
Lettering as in text-fig. 36.

characteristics of these structures, which do not appear to have been noticed in this genus of earthworms, though we shall point

out later that there are somewhat similar cavities in, at any rate, one other genus of earthworms. The naked-eye features of these organs was not unsuggestive of "cœlomo-ducts"; they are plainly part of the cœlom still, opening into it by a wide mouth and narrowing towards an opposite extremity. Naturally, therefore, the existence of any orifice on to the exterior of the body was carefully sought for. We have satisfied ourselves, however, that there is no external pore directly connected with these open sacs. Otherwise they suggested to us the "brown funnels" or "atrio-cœlomic funnels" of *Amphioxus*, discovered by Lankester<sup>1</sup>, which coexist in that animal with another kind of excretory organ, just as do the present structures with nephridia of the usual "perichaetous" type. And it may further be remarked, that in the brown tubes the shape is much the same, though the wide opening is into the atrial cavity (*i. e.* the exterior). There is, however, as already stated, no visible and direct external orifice to these funnel-shaped tubes. But they enclose abundant nephridia, and of these we have ascertained external pores. So that after all the cavity of the cœlomic pouches does communicate with the exterior. It is conceivable that we have here a state of affairs comparable to that seen in certain Polychæta where, according to Goodrich<sup>2</sup>, cœlomic funnels become secondarily connected with true nephridia. In *Pheretima* this connection is obviously vague and loose; but it may be, so to speak, a preparation for a closer

Text-fig. 38.



Transverse section through body-wall and underlying cœlomic pouches of *Pheretima posthuma*.

E, epidermis; C.S., cœlomic pouch; M, M', muscular layers of body-wall.

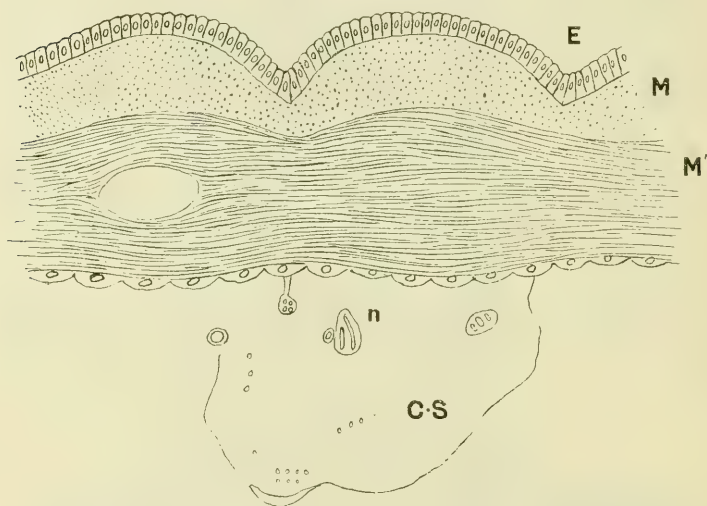
relationship. The microscopic structure of the walls and contents of these series of pouches has given no further clue to their morphological meaning, nor to the part which they play in the economy of the Annelid. The drawing exhibited (text-fig. 38) shows a longitudinal section through the couple of pouches of one side of the body, the "waist" or junction of the two being naturally in the middle. The walls are simple, composed of an

<sup>1</sup> "Contributions to the Knowledge of *Amphioxus lanceolatus*," Quart. Journ. Micr. Sci. xxix. p. 394.

<sup>2</sup> Goodrich: "On the Nephridia of the Polychæta," *ibid.* xli. p. 439.

extension of the peritoneum with lining of cells and a few slender muscular fibres. The wide opening at either end is conspicuous, and there is no difference of structure at this orifice. The wall simply leaves off. Transverse sections (text-fig. 39) taken at the widest part of the sac show that it forms here an absolutely closed sac, a chamber distinct from the general cœlomic cavity. Corpuscles were floating about, and, as already mentioned, nephridial tufts are frequent in the interior. Whatever may be

Text-fig. 39.



Longitudinal section through body-wall and underlying cœlomic pouch of *Pheretima posthuma*.

*n*, nephridia; other letters as in text-fig. 38.

the nature of this series of separate cœlomic cavities, there is in one genus of Oligochaeta a set of cavities which may perhaps be comparable to them. In *Lybiodrillus*<sup>1</sup> the area surrounding the lateral setae is in a similar way shut off from the general cœlomic cavity. There is not, however, in this case any conspicuous opening of the cavity so formed into the general cavity of the segments; the cavities in question are completely separated. Possibly in both cases we have to do merely with that tendency to the division of the cœlom into a number of completely or incompletely separated chambers which is so general in cœlomate animals. In any case, the facts described in the present communication appear to be novel, and at least furnish another example of the commencing subdivision of the cœlom in the Oligochaeta which culminates in their nearest allies the Leeches.

<sup>1</sup> Beddard: "On the Structure of an Earthworm allied to *Nemertodrilus*, &c.," Quart. Journ. Micr. Sci. xxxii. p. 546.

4. On some Points in the Anatomy of the Alimentary and Nervous Systems of the Arachnidan Suborder Pedipalpi.  
By R. I. Pocock, F.Z.S.

[Received May 30, 1902.]

(Text-figures 40-45.)

1. *The Nervous System of the Opisthosoma in the Thelyphonidae.*

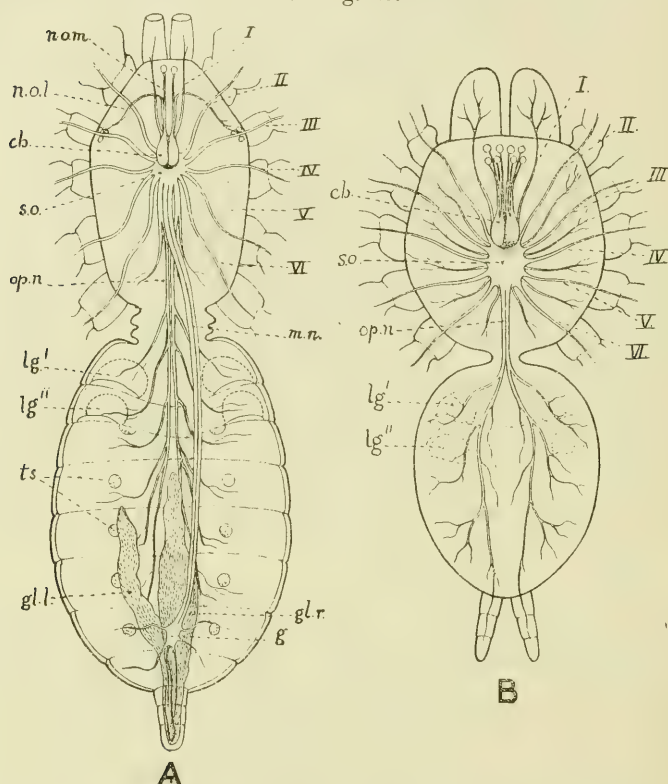
According to Blanchard<sup>1</sup> the opisthosoma of *Thelyphonus* is innervated as follows:—From the postaxial side of the trunk supplying the sixth appendage of the prosoma springs a nerve which passes backwards parallel to the median cord into the pregenital somite, giving off a slip to the muscles of that limb. Towards the posterior end of the prosoma, the median nerve-cord, which is described as single, sends off on each side a nerve which traverses the pregenital somite and divides into two branches, one for the first or genital somite, the other for the second somite. The nerves supplying the third, fourth, fifth, and sixth somites spring from a common centre, forming a minute ganglionic swelling on the median cord in the anterior portion of the genital somite. In the seventh somite the median cord forms a relatively large ganglion, whence five nerves radiate to the five posterior somites of the opisthosoma.

Blanchard's observations were based upon a species from Martinique, now known as *Mastigoproctus antillensis*. I have had no opportunity of dissecting specimens of this species. I find, however, a very different state of things in a Burmese species, *Hypoctonus formosus*. In the first place, the median cord is not single, but double. In the second place, it gives off no nerves between its point of origin at the posterior extremity of the subœsophageal mass in the prosoma and its ganglionic enlargement in the seventh somite of the opisthosoma (text-fig. 40, A, *m.n.*, p. 170). All the nerves which originally emanated from it to supply the pregenital somite and the anterior six somites of the opisthosoma have passed forwards and become united to the ganglionic mass of the prosoma. They form on each side a compound strand rising between the median nerve-cord and the nerves of the sixth appendage (text-fig. 40, A, *op.n.*, p. 170). Running backwards for a short distance, parallel with the median cord, and giving off a slender nerve to the muscles of the sixth appendage, they soon dip beneath the cord and meet in the middle line in the narrow channel between the coxæ of the appendages of the fifth pair. Posteriorly from this point the two cords extend side by side along the sternal surface of the body, beneath the double median strand. The nerve to the genital somite rises in the posterior

<sup>1</sup> Org. du Règne Anim., Arachn. p. 152, pl. viii. fig. 4.

end of the prosoma; that for the second somite in the pregenital somite; that for the third in the genital somite; while those to

Text-fig. 40.



Nervous system of the Araneæ and of the Pedipalpi of the family *Thelyphonidæ*.

A. Nervous system of one of the *Thelyphonidæ* (*Mastigoproctus giganteus*).

I-VI. Nerves supplying the six appendages of the prosoma. *n.o.m.*, nerves to the median eyes; *n.o.l.*, nerves to the lateral eyes (according to Blanchard); *cb.*, cerebral or supraoesophageal ganglionic mass giving off the nerves to the eyes and to the appendages of the first pair; *s.o.*, suboesophageal nervous mass giving off the nerves to the five pairs of postoral appendages (II-VI), also the two principal cords (*op.n.*) innervating the anterior six metameres of the opisthosoma and the paired median nerve (*m.n.*) which terminates in a ganglion (*g*) supplying the muscles of the caudal region; *lg'*, *lg''*, first and second lung-sacs; *gl.l.*, right, and *gl.r.* left "acid"-gland; *ts.*, tergosternal muscles.

[The median nerve-cord has been pulled aside to the right to show the subjacent nervous cords.]

B. Nervous system of a Mygalomorphous Spider of the family *Aviculariidae* (modified from Blanchard's figure), to show the similarity between the nerves (*op.n.*) supplying the opisthosoma and those marked *op.n.* in the figure of *Thelyphonus*.

Lettering as in A.



supply the fourth, fifth, and sixth somites diverge close together from a point in the third somite, whence the two strands appear to be closely bound together with connective tissue.

Since the two strands here described are formed by the union of the six nerves supplying the six anterior somites of the opisthosoma, it is not always easy to decide by dissection the exact points of divergence, and it is possible that some individual or specific variation will be found in this respect. In the main, however, I believe the arrangement described above to be fairly accurate.

Laurie<sup>1</sup> correctly describes the median nerve-cord as double, but was unable to trace the course and distribution of the fine nerves he noticed running alongside of it from the posterior end of the prosomatic mass. Presumably, like Blanchard, he did not observe that these nerves dip beneath the main cord. In connection with the acid-glands he describes a convoluted mass of tubules twisting about on each side of the central or right gland, and succeeded in tracing two of these tubules, apparently opening into the left sac. These tubules he interpreted as the purely secretive part of the gland. May they not have been the fine branches of the inferior system of nerves torn from their anterior attachments? This view of the matter would account for Laurie's failure to trace the course and distribution of the lateral nerves passing backwards into the opisthosoma from the posterior end of the prosomatic ganglionic mass.

Tarnani<sup>2</sup> says nothing of the nervous system of the opisthosoma. The nervous system of the opisthosoma in *Phrynus* is of a far more primitive type than that which I have described above in the case of the Thelyphonidæ. The nerves supplying the genital and the two following somites have passed forwards into the prosoma to join the ganglionic mass of this region, arising from it on each side between the nerve for the sixth appendage and the median cord. The threads innervating the rest of the somites of the opisthosoma spring laterally from the median cord, although well in advance of the somites to which they belong. They thus exhibit a marked tendency towards the state of things that has been completed in the Thelyphonidæ—namely, the isolation of the median cord by the annexation of its lateral threads by the prosomatic mass.

In the Thelyphonidæ it seems clear that the innervation of the flexible posterior end of the opisthosoma is the sole function of the median cord. If these organs were suppressed, the nerve-cord would become useless and might cease to be developed. The whole of the sternal surface of the opisthosoma would then receive its nervous supply from the cords I have above described, which would certainly be taken for the primitive median cord, although they would in reality represent merely its original laterally and metamerically diverging threads.

<sup>1</sup> Journ. Linn. Soc., Zool. xxv. 1894.

<sup>2</sup> Rev. Sci. Nat. St. Pétersb. 1890, no. 5, p. 255.

A specialization of this nature may, I suggest, be the explanation of the peculiarities of the nervous system of the Araneæ.

In '*Mygale*,' according to Blanchard, the opisthosoma is innervated from a median strand which passes backwards from the prosomatic mass into the pregenital somite, the so-called pedicel, and divides in the opisthosoma into a right and left cord, widely separated from each other in the middle line (text-fig. 40, B, *op.n.*, p. 170). Each extends backwards to the spinning-appendages, breaking up terminally into threads to supply the anal region of the opisthosoma. Each, moreover, gives off externally three principal nerves. The first and second arise far forwards in the opisthosoma and innervate the genital and the following somite, with their pulmonary sacs (text-fig. 40, B, *lg'*, *lg''*, p. 170); the third rises in the posterior third of the opisthosoma not far in advance of the point where the terminal cord breaks up into the threads above described.

This account I have verified in the case of *Ephobopus murinus*, a member of the same family as the '*Mygale*' dissected by Blanchard. The median cord that springs from the posterior end of the subesophageal mass is, of course, double, although the two strands are very closely applied as they pass through the 'waist.'

The exact points in the opisthosoma where the three nerves part from the principal strands is, in the absence of ganglionic centres, difficult to ascertain with accuracy, and probably varies in different types. Nevertheless the arrangement that Blanchard has depicted is in the main correct. A very similar state of things obtains in the Arachnomorphæ, where the opisthosoma is innervated on each side by four nerves which diverge from the common cord that proceeds from the prosoma into the genital somite of the opisthosoma.

If now, as is generally assumed to be the case, the two admedian nerve-strands represent the primitive median cord, their wide separation is not the only anomaly they present; for we shall be confronted with the fact that the Araneæ are the only Arachnida known in which all the somites of the opisthosoma are innervated by cords which spring from the main trunk within the opisthosoma itself. In all other orders, one (as in *Limulus*) or more of the somites in question receive their supply from the prosomatic mass with which their ganglionic centres have coalesced.

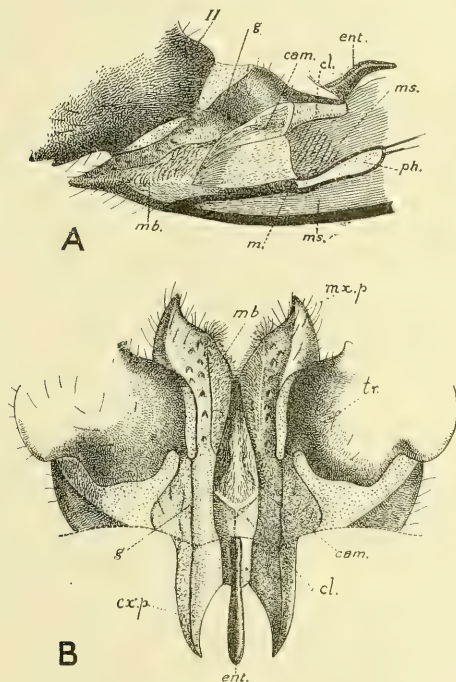
I venture to suggest, then, that in the Spiders the nerves of the opisthosoma represent the inferior system that has been described in the Thelyphonidæ, and not the primitive median strand with lateral branches as has been heretofore supposed.

## 2. *The Alimentary System of the Prosoma and Structure of the Mouth-parts in the Pedipalpi and other Arachnida.*

The first point to be noticed in the alimentary system of the Thelyphonidæ is the modification of the structure of the coxal or basal segments of the chelæ (appendages of the second pair). These segments, which were ancestrally freely articulated to the

fore part of the prosoma behind the mouth, have converged towards one another, so that laterally they embrace the sides of the camarostome or labrum (text-fig. 41, *cam.*). Dorsally, the proximal portion of the inner edge on each side forms a hinge-like joint with the adjacent edge of the dorsal wall of the

Text-fig. 41.



Mouth-parts of the *Thelyphonidæ* (*Mastigoproctus giganteus*).

- A. Inner aspect of the base of the right chela, that of the left side being cut away to show the camarostome in place, &c.: *ent.*, median entosclerite rising from the membrane above the base of the camarostome and affording support to the dorsal dilator muscle of the pharynx; *cl.*, proximal plate (clypeus) of camarostome which is articulated to the adjacent area of the coxa of the chela; *cam.*, hairy membranous portion of camarostome (labrum); *mb.*, hairy membranous area of inner surface of the coxa of the chela; *mx.p.*, maxillary process of the latter; *m.*, mouth lying beneath the base of the camarostome at the end of the long suboral trough formed by the fusion of the coxæ; *ph.*, anterior or pharyngeal portion of the stomodæum or foregut forming the pre-cerebral sucker of the alimentary canal; *ms.*, muscular tissue filling the cavity of the coxæ of the chelæ and of the camarostome; *tr.*, portion of the trochanter or second segment of the chela; *g.*, groove on the inner (preaxial) side of the coxa formed by an infolding of the chitin.

- B. Dorsal area of the camarostome and of the basal segments of the coxæ of the chelæ when the anterior end of the carapace and the chelicæ are removed.

Lettering as in A, with *cx.p.*, process of coxa which projects into the prosoma and supports the lateral dilator muscle of the pharynx.

camarostome; and the inner edges of their lower surface form a similar hinge-like union with each other in the middle line, this hinge appearing externally from beneath as a longitudinal groove passing between the two segments. These two hinges permit only of a restricted range of movement of the coxæ in a vertical plane, whereby the camarostome is compressed between them.

Originally, no doubt, the two apposed preaxial surfaces of the coxæ, where they met beneath the mouth and camarostome, persisted as a double partition separating the cavity of the coxa of the right side from the cavity of the coxa of the left side. But in existing forms this partition has disappeared, so that the cavities communicate freely with each other, the muscles of the two being contiguous in the middle line (text-fig. 41, A, *ms.*, p. 173).

The camarostome (rostrum, labrum) is large, broad in its basal half, narrowed and depressed at the apex, and wedged in between the coxæ of the chelæ, as described above. Its dorsal wall consists posteriorly of a chitinous plate, so-called *clypeus* (text-fig. 41, A, B, *cl.*, p. 173), which is laterally hinged on each side, as already stated, to the adjacent edge of the coxa, and is continuous posteriorly with the membrane that forms the anterior boundary of the prosoma. This membrane is folded forwards over the proximal portion of this plate and closely applied to it; and from the middle of its area arises a stout, hooked entosclerite, which projects backwards into the cavity of the prosoma (text-fig. 41, A, B, *ent.*, p. 173). Owing to the overfolding of this membrane and the closeness of its contact with the horny plate (*clypeus*), the latter appears upon dissection to jut backwards into the body-cavity, and the hook-shaped entosclerite appears to be an upgrowth from the middle of its dorsal surface. Maceration in caustic potash, however, reveals the true relations of the parts, and shows, further, that the entosclerite itself is a hollow invagination of the integument and unconnected with the horny plate.

Beyond its point of union with the coxæ, the camarostome is a free, membranous, or weakly chitinized hairy lobe. Distally, it is compressed and descends between the coxæ, overhanging the mouth and forming a flexible upper lip, hairy in the middle, and encircled laterally and below with a fringe of close-set, perhaps sensory hairs, which no doubt act also as a mechanical sieve, as Bernard says, to strain the solid from the liquid elements of the food. The cavity of the camarostome, which is irregularly elliptical in transverse section, is filled for the most part with muscles which pass from its roof to its floor, the latter being the dorsal wall of the entrance to the alimentary canal. When the dorsal integument or roof of the camarostome is cut away and the muscular tissue removed to display its floor, the latter is seen to be formed like the bowl of a deep and pointed spoon, the short handle of which is represented by the dorsal wall of the pharyngeal portion of the foregut with which the floor of the camarostome is posteriorly continuous.



The entrance to the alimentary canal between the camarostome above and the coxæ below is a wide, transversely crescentic slit with the concavity looking upwards. Its floor and outer sides are formed by a thickly chitinized, deeply hollowed plate, continuous along its upper and exterior edge on each side with the adjacent area of the inner surface of the coxa, of which it is a part; and posteriorly with the posterior extremity of the side of the camarostome, to which it is attached by membrane. It is finely grooved transversely, and beset with a thick coating of short delicate hairs. Posteriorly it is constricted, and in the middle line passes into the relatively narrow pharyngeal portion of the alimentary canal (text-figs. 42, C, *lam.*, p. 177, and 44, *lam.*, p. 183).

The roof and inner walls of the crescentic slit are formed by the sides and lower surface of the camarostome, which lies in the hollow of the plate described above, the two being united by membrane only along their posterior edges. Fine hairs clothe these surfaces of the camarostome, and a thick fringe of hairs projects beyond the apex from near the distal extremity of this organ. The under surface of the camarostome is posteriorly continuous in the middle line with the dorsal wall of the pharynx, as already stated (text-fig. 41, A, *cam.*, *ph.*, p. 173).

The crescentic slit above described is not closed above, but opens on each side between the outer surfaces of the camarostome and the adjacent inner surfaces of the coxæ of the chelæ, which are continuous with the horny plate forming the outer sides and floor of the slit. Fluid taken into the slit would be prevented from escaping upwards through its open extremities by the hairs clothing the inner side of the coxæ (text-figs. 41 & 42, *mb.*, pp. 173, 177) and the outer portion of the upper surface of the camarostome.

It will thus be clear that the so-called mouth of the Thelyphonidæ, *i. e.*, the aperture that lies between the tip of the camarostome above and that of the horny plate below, is a secondarily acquired aperture produced by the forward extension and union of the coxæ of the chelæ and the elongation and depression of the camarostome. The true mouth, *i. e.*, the entrance to the stomodæum or foregut, representing the mouth of the Scorpions and *Phrynus*, is the relatively narrow aperture by which the pharynx debouches into the above described slit (text-fig. 41, A, *m.*, *ph.*, p. 173).

The key to the mode of formation of this arrangement is to be found in the mouth-parts of the Amblypygi (*Phrynus*), which so far, at all events, as the freedom of the coxæ of the chelæ is concerned, are admittedly less specialized than those of *Thelyphonus*. In *Phrynus* the camarostome is relatively a very small flexible lobe overhanging the mouth, and furnished dorsally with a small heart-shaped sclerite representing the chitinous plate of *Thelyphonus* (text-fig. 42, A, B, *cam.*, *m.*, p. 177). The coxæ of the chelæ have fused below the mouth and separate it entirely from the forwardly directed prosternal plate of the prosoma, which is the sternum of the second postoralsomite (text-fig. 42, A, B, *st.*, p. 177). When forcibly



approximated in the middle line, in simulation of the position those of *Thelyphonus* have permanently assumed, the coxæ of *Phrynus* form a long channel, or gutter, open above and extending from their distal extremities backwards to the mouth. The sides of this channel are beset with longish hairs over the greater part of their extent (text-fig. 42, A, B, *mb.*, p. 177); but proximally on each side there is a sharply defined, elongate, pubescent area, which fuses with its fellow of the opposite side immediately below the mouth, and stretches a considerable distance forwards in advance of it. Stripped of its pubescence, this area is seen to consist of a horny thickening of the integument (text-fig. 42, A, B, *lam.*, p. 177). If the coxæ were to fuse in the middle line, the union of these chitinous areas would form a horny plate similar to that of *Thelyphonus*, and the enlargement of the camarostome and the fusion of its basal sclerite with the coxæ would reproduce the state of things now found in the last-named genus.

Bernard's account and figures of the mouth of *Thelyphonus* I cannot reconcile with the facts just described. In his paper on the morphology of the Galeodidæ<sup>1</sup> (p. 357) he says: "*Thelyphonus* also [*i. e.* as well as *Galeodes*] has a beak, but it is enclosed between the basal joints of the pedipalps, which are fused below it but are open above it. The chelicerae crush the prey into the channel thus formed by the coxæ of the pedipalps, and the juices are drawn in by the powerful pumping apparatus. They are strained by transverse rows of fine hairs, which line the aperture." And in the preceding page he says: "We find . . . the pumping apparatus contained in a beak in such widely different groups as *Galeodes*, *Thelyphonus*, and *Gamasus*."

From this it might be inferred that *Thelyphonus* has a beak resembling that of *Galeodes*, but with its inferior surface fused to the subjacent area of the trough-like hollow formed by the fused inner (preaxial) surfaces of the chelæ (pedipalps). And the three figures representing transverse sections of the buccal region bear out this interpretation. The first section, taken near the extremity of the camarostome, and the second probably near its middle, clearly show the crescentic slit-like hair-lined entrance to the alimentary canal which Bernard regards as the oral aperture. But the two upwardly directed extremities of this canal are represented as closed above. Moreover, these two figures show the coxal cavities of the right and left sides separated from each other by a median vertical partition extending to the floor of the space in which the 'rostrum' rests. I have not found this partition in any adult *Thelyphonus*. No doubt it was present in the young and in the parent form of the race. Its persistence in the adult as the thick horny rod depicted in Bernard's drawings would considerably interfere with the movements the coxæ perform to compress the camarostome. The third section, passing apparently through the camarostome a short distance in front of the

<sup>1</sup> "Comparative Morphology of the Galeodidæ," Trans. Linn. Soc. ser. 2, Zool. vi. pp. 305-417.



true oral aperture, shows the inferior wall of the still wide, but less strongly crescentic slit to be formed by a thickish transverse horny plate which is described as the "persistent sternum of the 1st and 2nd segments" or the "supporting-rod of the labium." Reference for comparison is given to a figure showing what purports to be the same plate projecting forwards between the coxæ when these segments are viewed from below, although the figure showing the plate in transverse section represents it as situated high above the lower surface of the coxæ. This plate is no doubt the thickened portion of the floor of the crescentic slit, which is situated just in front of the true oral aperture; but I cannot establish any connection between it and the prosternum (sternum of the second postoral somite), or any part of the sternal exoskeleton.

Again, speaking of the "beak" of Arachnida, Bernard says (*op. cit.* p. 391):—"The possession of this organ in such diverse Arachnida as *Galeodes*, *Chernes*, and *Thelyphonus*, and the easy deduction of the mouth-parts of Spiders, *Scorpio* and *Phrynus*, from such an organ, renders it almost certain that a beak was present in the original Arachnid."

If the "beaks" of *Galeodes*, *Chernes*, and *Thelyphonus* were similarly constructed organs, this argument would have weight; but, as a matter of fact, each of the orders represented by the three Arachnids cited possesses a "beak" which is *sui generis* and distinct from that of the other two, as well as from that of all the other orders of the class<sup>1</sup>.

Far more probable is it, in my opinion, that the "beaks" of *Thelyphonus*, *Galeodes*, and *Chernes* are derivatives of mouth-parts of a much simpler type, consisting primarily of a camarostome or prostomial labrum overhanging the oral aperture. So, too, from this type can be deduced the very highly specialized "beak" of a fourth kind which is met with in many Spiders, *e. g.*, *Filistata*, *Sicarius*, &c.

In fact, the types of mouth-parts characteristic of *Scorpiones*, *Thelyphonus*, *Phrynus*, *Galeodes*, *Pseudoscorpiones*, *Araneæ*, &c., are all traceable to one and the same simple plan of structure, the modifications that are presented resulting from the formation, one might almost say the necessity for the formation, of a suboral trough to take up nutritive fluids. The one feature these mouth-parts have in common is the labrum or camarostome. In the *Scorpiones* the suboral trough is formed by the sterno-coxal (maxillary) processes of the third and fourth appendages (1st and 2nd walking-legs) (text-fig. 43, A, B, III, IV, p. 180). In *Phrynus* it results from the basal union beneath the mouth and the potential approximation throughout their length of the preaxial surface of the coxæ of the appendages of the second pair (chelæ or palpi).

<sup>1</sup> The diagrams representing transverse sections of the mouth-parts in *Scorpio*, *Obisium*, and *Galeodes*, figured on pl. xxvii. figs. 9a-9c of Bernard's paper, show very clearly the resemblances and differences and the true relations of the organs.

From this arrangement may be derived that of *Thelyphonus*, as already described (p. 175).

In the Spiders the trough is formed by the median prosternal plate (the labium or sternum of the first postoral sonite) which projects from beneath and beyond the mouth (text-fig. 43, D, *lab.*, p. 180). The space on each side between this plate and the camarostome is blocked by the coxa of the appendage of the second pair. Within the order Araneæ the simplest type of mouth-parts is found in the primitive Mesothelæ and Mygalomorphæ, where the camarostome is high and short, and the coxæ in question but little modified. In the Arachnomorphæ, on the contrary, the camarostome is longer, depressed, and overlaps the labium, the two being flanked on each side by a preaxial process from the coxa—the so-called maxilla (text-fig. 43, C, D, *cam.*, *max.p.*, p. 180). In more primitive forms the appendages of the first and second pairs (mandibles and palpi) are freely movable, and the labium is separated from the rest of the sternum. But in certain other forms the labium and basal segments of the palpi are fused to the sternum, the maxillary processes meet in front of the labium, and the mandibles are mesially hinged together and susceptible of but little movement; the five sclerites in question, together with the camarostome which they completely enclose, constituting a highly specialized "proboscis," equal in complexity to that of many Acari.

Viewed from above, the mouth-parts of the Pseudoscorpiones (*Garypus*) much resemble those of *Thelyphonus* and the Spiders. The camarostome is long, porrect and, as in *Thelyphonus*, fused dorsally on each side in its basal half to the adjacent preaxial surface of the coxa of the 2nd appendage (chela), which projects forwards on each side of it. Distally, it ends in a subcylindrical fleshy lobe which reaches to the end of the membranous sternocoxal (maxillary process) of the coxa (text-fig. 42, D, *cam.*, *max.p.*, p. 177). Inferiorly, however, instead of being uniformly convex, it is deeply grooved longitudinally, the groove giving rise to a pair of lips, a right and a left. Projecting forwards into the groove between these two lips is a compressed and pointed prosternal or labial prolongation, which arises at its basal end from the inferior part of the area between the juxtaposed proximal ends of the preaxial surfaces of the coxæ (text-fig. 42, D, *lab.*, p. 177). These coxæ meet, without fusion, in the middle line beneath the prosternal process, and form, as in *Thelyphonus*, a trough to prevent the escape of fluid; the labium (prosternum), which, like the lips of the camarostome, is thickly hairy, constituting a kind of tongue-like organ<sup>1</sup>, above their line of meeting!

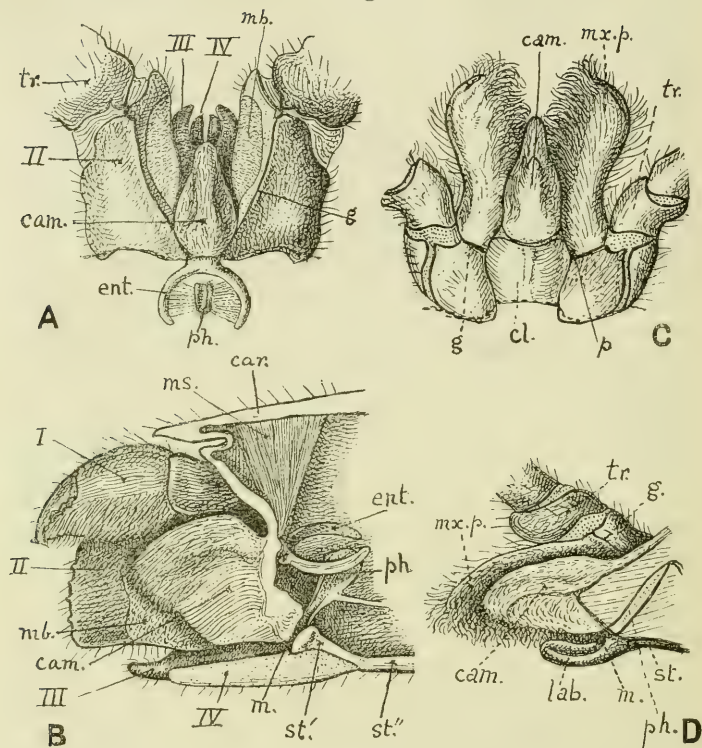
In the Podogona or Ricinulei (*Cryptostemma*) and most (?all) Acari the suboral trough results from the union of the coxæ of the palpi beneath the camarostome.

In the Solifugæ (*Galeodes*) the "beak" is quite peculiar. It consists of a horizontally porrect tubular proboscis, bearing the

<sup>1</sup> See Croneberg, Arch. f. Nat. 1880.



Text-fig. 43.



Mouth-parts of the Scorpiones and of the Araneae of the family *Lycosidae*.

- A. Dorsal view of the mouth-parts of a Scorpion (*Palamnaeus*), with the chelicerae removed: *ent.*, crescentic entosclerite supporting the lateral dilator muscles of the pharynx (*ph.*); *cam.*, camarostome; II, coxa of second appendage or chela, with *mb.*, hairy membranous tract, and *g.*, entapophysial groove; *tr.*, trochanter or second segment of chela; III and IV, sternocoxal or maxillary processes of third and fourth appendages (first and second walking-legs) forming the suboral trough.
- B. Lateral view of the mouth-parts of a Scorpion (*Palamnaeus*), the chela, chelicera, and anterior portion of the prosoma of the left side removed: *car.*, cut edge of middle line of carapace; *ms.*, vertical muscle passing from carapace to the crescentic entosclerite (*ent.*); I, appendage of first pair, or chelicera; *m.*, mouth leading into pharynx or pre-cerebral sucker (*ph.*); *st.*', anterior portion of sternal area of prosoma, which is normally concealed by the coxa and sternocoxal process of the appendage of the fourth pair (IV), forming the suboral trough; *st.*'', posterior or exposed part of the sternal area forming the pentagonal metasternite.
- C. Dorsal view of the mouth-parts of a Spider (*Lycosa ingens*), with chelicerae removed, showing the camarostome (*cam.*) flanked on each side by the large maxillary process (*mx.p.*) of the coxa of the second appendage or palpus; *cl.*, basal sclerite (*clypeus*) of camarostome, which is united with the adjacent area of the coxa as far as the point *p*; *g.*, entapophysial groove of coxa lying transversely, not longitudinally as in the Scorpiones, Pedipalpi, and Pseudoscorpiones.
- D. Lateral view of the same, with the same lettering as in C, with *m.*, mouth leading into pharynx or pre-cerebral sucker (*ph.*); *lab.*, labium or sternal plate of first postoral somite forming the suboral trough; *st.*, anterior portion of median sternal sclerite.



aperture of the alimentary canal at its apex. Its dorsal wall is formed by the horny compressed camarostome. Its ventral wall is an outgrowth of the suboral area of the prosoma, supported posteriorly by a prosternal sclerite and by the juxtaposed coxæ of the palpi, fused laterally to the camarostome throughout its length; it thus constitutes a lower lip which effectually prevents the loss of liquid food, without any share in this office being taken by any part of the coxæ of the adjacent appendages. The special point in which this "beak" resembles that of the Acari is the fact that it forms the sucking-apparatus of the alimentary canal. Otherwise it is unique in the class Arachnida, its parallel being found only in the, in some respects, degenerated Palpigradi.

That a "beak" of this kind, which is evidently developed in correlation with the long, porrect, and non-retractile chelicæ, was the starting point of the diverse modifications met with in the other orders of Arachnids, seems in the highest degree improbable. Such an hypothesis demands the suppression of the lower lip of the "beak," and its independent replacement functionally by the particular types of suboral trough already described.

On the other hand, there is no difficulty in regarding all these various kinds of "beaks" as specialized organs resulting from the presence of a camarostome or labrum, and the need for a lower lip or suboral gutter to prevent the loss of nutritive fluids and to guide them into the alimentary canal.

The muscles of the camarostome in *Thelyphonus*, which Bernard regards as the beginning of "the sucking-apparatus," seem to have the same function as those of the Scorpion, being, as in that animal, distinct from the suctorial pharynx, which constitutes "the sucking-apparatus" *par excellence*.

In connection, then, with the anterior portion of the alimentary canal, suckers may be developed in three distinct places—that is to say, in the camarostome itself, as in the Solifugæ, Palpigradi, and Acari; in the pre-cerebral portion of the foregut, as in the Scorpiones (text-fig. 43, A, B, *ph.*, p. 180), Opiliones, and Pseudoscorpiones; or in its post-cerebral portion, as in the Aranæ, Palpigradi<sup>1</sup>, and Amblypygous Pedipalpi (*Phrynus*).

In the Aranæ and Amblypygi (text-fig. 45, *ph.*, *st.*, p. 186) the pre-cerebral and post-cerebral suckers coexist, and are especially powerful in the former order. In the Palpigradi the post-cerebral sucker is aided in its work by the organ developed in the camarostome. In the Scorpiones and Opiliones the pre-cerebral sucker alone is found. In the Uropygous Pedipalpi it is also well developed; the post-cerebral, on the contrary, is very small as compared with that of the Amblypygi, but the muscles of the camarostome probably aid in the office of suction. The same is true of the Pseudoscorpiones, with the exception that the post-cerebral sucker is absent. In the Solifugæ and Acari the function of suction is apparently performed solely by the muscles of the camarostome.

<sup>1</sup> Rucker, Amer. Nat. xxxv. 1901.

The pharyngeal portion of the foregut in *Thelyphonus* which opens at its anterior end into the slit above described is a wide membranous tube, strengthened with four chitinous strands, a right and left upper and a right and left lower. The latter are directly continuous with the chitinous plate forming the floor of the suboral trough; the former with the posterior extremity of the lower surface of the camarostome forming the roof of the trough. From its dorsal walls muscles pass to the under surface of the median entosclerite which arises from the membrane above the base of the camarostome, and from its sides muscles extend to an in-jutting process from the coxa of the chela<sup>1</sup> (text-fig. 41, A, B, *ent.*, *cx.p.*, p. 173).

It thus constitutes a powerful, dorso-ventrally compressed, pharyngeal or pre-cerebral sucking apparatus, homologous to that of the Scorpions and Spiders (text-fig. 43, D, *ph.*, p. 180). In the Scorpions, however, the organ is compressed from side to side, and its lateral muscles pass to the crescentic preoral entosclerite, which represents the median entosclerite above the camarostome of *Thelyphonus*<sup>2</sup> (text-fig. 43, A, B, *ent.*, *ph.*, p. 180).

From this point the foregut narrows and runs backwards through the brain as a relatively soft, flexible, and weakly chitinous tube. Between the brain and the anterior bridge of the entosternite it forms a lanceolate expansion, comparable to the so-called "sucking-stomach" of the Spiders, though not, apparently, supplied with the powerful dilator and contractor muscles characteristic of this organ in the last-named order.

Behind this expansion the gut passes between the descending branches of the aorta and expands into the saccular stomach of the midgut. This is provided with five pairs of principal diverticula, which are often of irregular shape and sometimes asymmetrically branched, and extend towards the coxæ of the postoral appendages, sometimes dipping into the cavities of those of the legs (text-fig. 44, 1-5, p. 183). The diverticula of the anterior pair arise behind the descending portion of the aorta, and passing forwards on each side of it, unite in the middle line, thus circumscribing a space through which, in addition to the aorta, the obliquely ascending pair of apophyses from the entosternite runs

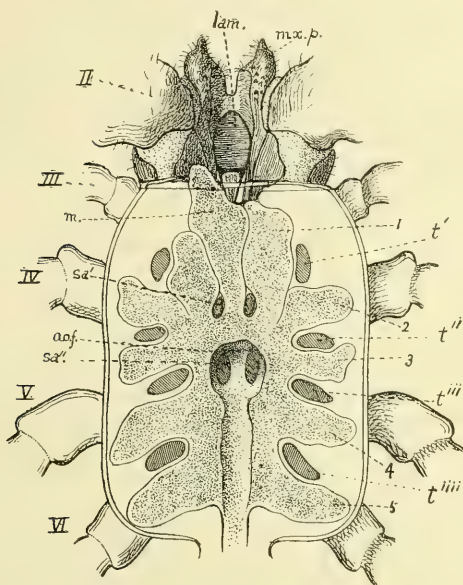
<sup>1</sup> From Laurie's description it is not clear which of the two apertures, *i. e.* that at the distal or at the proximal end of the camarostome, he signifies by the word "mouth." Probably scarcity of material prevented an accurate dissection of this region; otherwise it is difficult to account for the misleading statement that the foregut (stomodæum) of *Thelyphonus* has "no appearance of a dilatation into a sucking stomach such as is found in the Scorpion"; nor for the erroneous assertion that "the muscles of the anterior part of this stomodæum" pass to three chitinous processes running back from the camarostome. Two of these three entosclerites are the in-jutting angular processes of the coxæ of the chelæ, and the third arises from the membrane above the camarostome.

<sup>2</sup> It is singular that Blanchard (*Org. du Règne Anim.*, Arachnides) overlooked this enlarged pre-cerebral pharyngeal sucking portion of the alimentary canal in *Thelyphonus*. The same oversight characterizes his observation upon this region in '*Mygale*,' and, as Huxley pointed out, in *Scorpio*. In the case of *Phrynus*, however, he both figured and described it, homologizing it with the œsophageal portion of the canal in *Thelyphonus*.

to their points of attachment to the middle line of the posterior half of the inner surface of the carapace (text-fig. 44, *sa''*).

In front of this space arises a median unpaired diverticulum which extends forwards between the diverticula of the anterior pair; and protruding on each side of it may be seen a second pair of muscles which run to the carapace from the branch of the entosternal apophysis just mentioned (text-fig. 44, *m.*, *sa'*).

Text-fig. 44.

Alimentary system of the prosoma of the *Thelyphonidae*.

Prosoma of one of the *Thelyphonidae* (*Hypoctonus formosus*), with carapace, camarostome, and chelicerae removed. II-VI. Basal segments of the five pairs of postoral appendages; *mx.p.*, maxillary process of coxa of chela; *lam.*, spoon-shaped plate which underlies the camarostome; 1-5, lateral caecal diverticula of midgut; *m.*, anterior median diverticulum of midgut; *t'*-*t'''*, the four lateral apophyses of the entosternite representing the tergo-sternal muscles; *sa'*, anterior branch and *sa''*, posterior branch of the supernumerary apophysis; *aof.*, foramen through which the aorta descends to the ventral region of the body and the muscular apophyses (*sa''*) ascend to the median line of the carapace.

The arrangement of the remaining diverticula with regard to the four pairs of lateral tendinous processes of the entosternite is typically as follows:—The fifth or last pair passes behind the fourth or last process, the fourth, third, and second respectively between the fourth and third, third and second, second and first apophyses of this plate; the first, as already described, running straight forwards on the inner or admedian side of the first

apophysis, which rises from the distal extremity of the anterior bar of the entosternite (text-fig. 44,  $t'$ - $t^{iiii}$ , p. 183). The form and position of these diverticula, however, seem to vary considerably in accordance with the degree of their distention with food-particles. When filled from base to extremity they are of fairly uniform width throughout. When partially empty their distal portions take the form of slender subcylindrical tubes differing considerably, both in appearance and shape, from the charged basal portions.

To this difference is to be ascribed Blanchard's<sup>1</sup> erroneous description of the stomach as consisting of four pairs of lateral cæca, enveloped above and below by a large tubular or salivary gland. In the specimens he dissected, belonging to the species now known as *Mastigoproctus antillensis*, the four posterior pairs of cæca appear to have been partially empty, while the anterior cæca and the central portion of the midgut were distended. I have found a similar state of things in the examples of *Mastigoproctus giganteus* and of *Uroproctus assamensis* that I have examined, whereas in all the examples of *Hypoctonus formosus*, all collected at the same time, the diverticula were evenly filled throughout. Hence the possibility that the width of the terminal portions of the diverticula may vary with the species, and may not be attributable to the cause I have suggested, must be borne in mind. Blanchard neither figures nor describes the anterior median diverticulum, present in all the specimens of Thelyphonidæ I have examined. Possibly it was not distended in his examples. Apart from this discrepancy, and from a too sharply defined line of demarcation between the filled and unfilled portions of the cæcal diverticula, evidently introduced to emphasize the distinctness of the so-called "tubular" or "salivary" gland, his figures admirably represent the "stomach" in this group, even to the spaces through which the two pairs of muscles pass to the middle line of the carapace. They also show the two inferior median diverticula which dip down through the median foramina of the entosternite and extend along its underside. Being filled with food, these were described as part of the tubular or salivary gland. Laurie mentions them as well. This author's description of the thoracic portion of the midgut as expanded into wide lateral diverticula, which extend over the brain in front and the coxal glands at the sides, each diverticulum being divided into five lobes, is correct so far as it goes, but too insufficiently detailed to criticise. The figure

<sup>1</sup> Blanchard (Org. du Règne Anim., Arachnides) described the "stomach" of *Thelyphonus* as consisting of a sac giving off four pairs of cæcal diverticula and enveloped above and below by voluminous glands of two kinds, described in the text as "utricular" and "tubular" glands. The former (=coxal gland), embracing the stomach laterally, are compared to the "salivary" glands, so-called by Newport and Müller, of the Scorpions.

How Blanchard and others, for reasons that need no explanation, ascribed an alimentary function to the coxal gland is now ancient history; but his mistake in homologizing the coxal glands of *Thelyphonus* with the prosomatic midgut diverticula of *Buthus* is less intelligible. A further error into which he fell was the interpretation of part of the midgut diverticula in *Thelyphonus* as a "tubular" digestive gland.



that is given of the organ, however, suggests an arrangement of diverticula quite different from that obtaining in the specimens dissected by Blanchard, Tarnani, and myself. It represents a wide diverticulum as arising, on each side, *in front* of the descending trunk of the aorta, and extending backwards on each side of the horizontally lying portion of this vessel to the posterior end of the prosomatic cavity, giving off the five caecal diverticula along its course. There is nothing to indicate the formation of the annular space through which the aorta and the two muscular tendons of the entosternite pass.

Tarnani says the foregut of *Thelyphonus* is like that of the Spiders. This seems to be an overstatement of the case. In the Spiders, the dorsal muscle of the pre-cerebral pharyngeal sucker extends to the median line of the anterior portion of the carapace, not to a chitinous entosclerite as in *Thelyphonus*. Moreover, the wall of the oesophageal portion of the foregut is much more thickly chitinized and more rigid than in *Thelyphonus*, and is supplied with a well-developed post-cerebral sucking-apparatus lying on the upperside of the entosternite and worked by powerful lateral muscles which attach it to this plate, and by a dorsal muscle which passes from its chitinous dorsal wall through the aortic space of the "stomach" to the median entapophysis of the carapace.

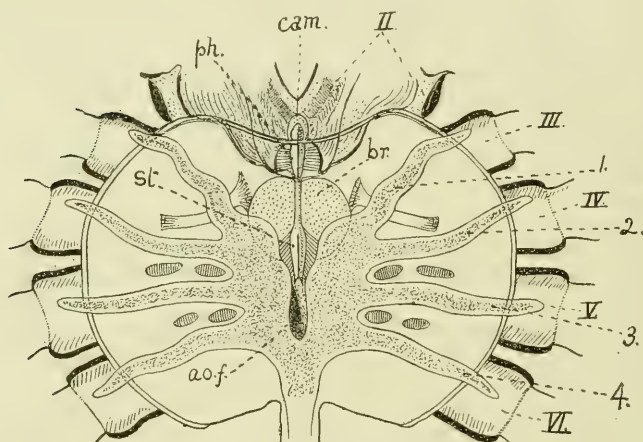
In many structural characters the Amblypygi are intermediate between the Urotricha (*Thelyphonidæ*) and the Spiders. This is strikingly the case with regard to the foregut. The pharyngeal portion is narrower and less strongly chitinized than in *Thelyphonus*, and the muscles of the pre-cerebral sucker extend dorsally to a median entosclerite rising from the membrane above the base of the camarostome, and laterally to the coxæ of the chelæ. The latter, however, are not immovably united like those of *Thelyphonus*, but move freely in a horizontal plane, and compress the sucker between their inprojecting ends. The oesophageal portion of the foregut is a sinuous tube with rigid chitinous walls, like that of the *Aranæ*; and behind the brain it forms a highly developed sucking-apparatus, with dorsal muscle extending to the undersurface of the carapace and lateral muscles passing to the entosternite. This organ differs from that of the Spiders only in position. Instead of resting upon the entosternite and being attached to its upperside by transverse muscles, it lies in front of it in the "pharyngeal notch," the lateral muscles extending to the anterior border of this plate. Thus in position it resembles the less highly specialized organ of *Thelyphonus*.

The midgut expansion, with its diverticula, more resembles that of some Spiders than of the *Thelyphonidæ*. As in these groups, the primary saccular diverticulum extends forwards on each side of the descending aorta, forming a channel through which this vessel continues its downward course, and the muscle from the post-cerebral sucker and the two obliquely directed apophyses from the entosternite ascend to the median depression on the



carapace. In front of this channel the two diverticula generally meet and overlap as in some Spiders (e. g. *Argyroneta*, according to Plateau), but without fusing or communicating. The diverticula of the anterior pair, which are so conspicuous in the Thelyphonidæ, remain undeveloped. Those that extend into the coxæ of the 3rd, 4th, 5th, and 6th appendages are relatively slender unbranching tubes, longer and more regular in shape than those of *Thelyphonus*. Their relation to the entapophyses of the entosternite differs also from that which obtains in *Thelyphonus* and the Spiders, where the five diverticula typically pass with regularity between the four apophyses which rise to the sides of the under surface of the carapace (text-fig. 45, 1-4).

Text-fig. 45.

Alimentary system of the prosoma of one of the *Phrynidæ*.

Dorsal view of the alimentary system of the prosoma of a Phrynid (*Titanodamon johnstoni*, partially diagrammatic). II-VI. Basal segments of the five pairs of postoral appendages; *cam.*, camarostome; *ph.*, pharynx or pre-cerebral sucker of the foregut; *br.*, subesophageal portion of central nervous system traversed by the chitinous œsophagus which expands into the post-cerebral sucker of the foregut (*st.*); 1-4, cæcal diverticula of the midgut passing between the muscular apophyses of the entosternite, as described in the text; *aof.*, foramen or channel through which the dorsal aorta descends to the ventral region of the body and a pair of muscular apophyses (not shown in fig.) ascend to the middle line of the carapace.

In the Amblypygi these four apophyses are represented by six, the first and second apparently corresponding to the first in *Thelyphonus* and the Spiders, the third to the second, the fourth and fifth to the third, and the sixth to the fourth. The fourth and last diverticulum in *Phrynus*, corresponding to the fifth and last in *Thelyphonus* and the Spiders, passes, as in those groups, behind the last apophysis; and the first diverticulum in *Phrynus*, corresponding to the second in *Thelyphonus* and the Spiders, passes

on the outer and posterior side of the first apophysis between it and the second, which results apparently from its fission and is unrepresented in *Thelyphonus* and the Spiders, although, so far as the diverticula are concerned, it corresponds to the second apophysis in these groups, inasmuch as it juts up between the diverticula which extend towards the third and fourth appendages (first and second pairs of legs). The third apophysis, the homologue of the second in the other groups, instead of rising behind the first diverticulum, emerges behind the second with the anterior branch of the fourth, while the posterior branch of the fourth (numerically the fifth) similarly appears behind the third diverticulum in company with the sixth apophysis.

Or if, for the sake of clearness, we assume that there were originally five diverticula representing the five postoral somites, and four apophyses belonging to the first four of these somites, and that the diverticulum passed in front of the apophysis in each somite, as is the case in the Spiders and Thelyphonidæ; and further, if we assume that the two additional apophyses in *Phrygnus* have been derived by fission from those of the first and third postoral somites, the differences between *Phrygnus* and the others with regard to the arrangement of diverticula and apophyses may be briefly stated as follows:—The apophysis of the second postoral somite has moved backwards behind the diverticulum of the third postoral somite, its place behind its appropriate diverticulum being taken by the outer branch of the first apophysis, and the extra branch of the third apophysis has similarly shifted back behind the diverticulum of the fourth postoral somite.

Laurie describes the stomodæum as “a narrow tube extending from the mouth to a little behind the brain. In front of the brain there are attached to it powerful muscles running dorsally to be inserted in the carapace behind the median eyes. Lateral muscles are also present in this region, which no doubt has a suctorial function, though there is no sign of any dilatation to form a sucking-stomach. Close behind the brain, and just in front of the junction between the stomodæum and the mesenteron, are inserted some more muscles which also pass dorsally to the carapace. The anterior part of the mesenteron is dilated to form a sort of stomach as in *Thelyphonus*. The dilatation seems to take the form of a single pair of lateral outgrowths, very similar at this [embryonic] stage to those of the ‘liver.’ A small median ventral outgrowth is also present, and reminds one of the median processes in *Thelyphonus*.”<sup>1</sup>

These observations were based upon embryos. The only discrepancy between this description and that given above of the adult, is the attachment of the muscles of the pre-cerebral sucker to the under surface of the carapace.

Blanchard's description, based upon the adult, makes no mention of the muscle which passes dorsally from the pre-cerebral sucker

<sup>1</sup> Journ. Linn. Soc., Zool. xxv. p. 32 (1894).

to the median vertical entosclerite; nor of the presence of a post-cerebral sucker in the foregut, worked by lateral muscles attached to the anterior border of the entosternite and by a dorsal muscle extending to the underside of the carapace. Nor is the forward extension of the stomach on each side of this ascending muscle and the descending aorta to form a channel, through which arise also the two obliquely directed tendons of the entosternite, mentioned. Since these structures are not represented in the figures, it is permissible to suppose they were overlooked.

5. On Recent Additions to the Batrachian Fauna of the Malay Peninsula. By A. L. BUTLER, F.Z.S., Superintendent of the Sudan Game Preservation Department, Khartoum.

[Received June 9, 1902.]

The papers by Captain Stanley S. Flower on the Reptiles and Batrachians of the Malay Peninsula, published in this Society's 'Proceedings' during 1896 and 1899, have been so valuable to local workers, that it may be useful to bring the list of Batrachians of the Peninsula up to date by enumerating the species obtained for the first time from that region since the appearance of Captain Flower's second paper.

In that list (P. Z. S. 1899, pp. 885 *et seq.*) 45 species of Batrachians are recorded from the Malay Peninsula, including *Megalophrys montana* Kuhl, mentioned somewhat doubtfully in a note, but since obtained again by the "Skeat Expedition," and two species, *Rana jerboa* Gthr., and *Nectës subasper* Tschudi, mentioned in the Addenda.

To bring the list up to date, the following 13 species have now to be added, carrying the total number up to 58.

Four of these species, *Rana livida*, *Rana doriae*, *Rhacophorus bimaculatus*, and *Leptobrachium pelodytoides*, have not been hitherto recorded from the Peninsula.

Fam. RANIDÆ.

1. RANA SIGNATA Gthr.

*Rana signata* Laidlaw, P. Z. S. 1900, p. 886.

*Locality.* Gunong Inas ("Skeat Expedition").

*Previously known from* Borneo.

2. RANA LIVIDA Blyth.

*Rana livida* Boulenger, Faun. Ind., Rept. p. 462.

*Locality.* Larut, Perak (L. Wray). Identified by Mr. Boulenger.

*Previously known from* Himalayas and Assam to Tenasserim.

3. *RANA LATERALIS* Blgr.

*Rana lateralis* Laidlaw, P. Z. S. 1900, p. 886.

*Locality.* Kuala Aring ("Skeat Expedition").

*Previously known from* Burmah.

4. *RANA DORIE* Blgr.

*Rana dorie* Boulenger, Ann. Mus. Genova, (2) v. 1887, p. 482, pl. iii. fig. 1; ib. xiii. 1893, p. 328, pl. viii. fig. 1; Faun. Ind., Rept. p. 447.

*Locality.* Larut, Perak (L. Wray). Identified by Mr. Boulenger.

*Previously known from* Karin Hills, Tenasserim, Mergui.

5. *RHACOPHORUS BIMACULATUS* Blgr.

*Rhacophorus bimaculatus* Boulenger, Cat. p. 90; Faun. Ind., Rept. p. 472; Ann. Mus. Genova, (2) xiii. 1893, p. 339.

*Locality.* Larut Hills, Perak (L. Wray). Identified by Mr. Boulenger.

*Previously known from* E. Himalayas, Karin Hills, Khasi Hills.

6. *IXALUS LARUTENSIS* Blgr.

*Ixalus larutensis* Boulenger, A. M. N. H. (7) vi. Aug. 1900, p. 187.

*Locality.* Larut Hills, Perak, 4000 to 4500 ft. (A. L. Butler).  
Type specimens.

7. *IXALUS VERMICULATUS* Blgr.

*Ixalus vermiculatus* Boulenger, A. M. N. H. (7) vi. Aug. 1900, p. 187.

*Locality.* Larut Hills, Perak, 4000 ft. (A. L. Butler).  
Types.

## Fam. ENGYSTOMATIDÆ.

8. *MICROHYLA INORNATA* Blgr.

*Microhyla inornata* Laidlaw, P. Z. S. 1900, p. 887.

*Locality.* Bukit Goah, near Biserat, Jalor ("Skeat Expedition").

*Previously known from* Sumatra, Borneo, and Siam.

9. *MICROHYLA ANNECTENS* Blgr.

*Microhyla annectens* Boulenger, A. M. N. H. (7) vi. Aug. 1900, p. 188.

*Locality.* Larut Hills, 4000 ft. (A. L. Butler).  
Types.

10. *MICROHYLA BUTLERI* Blgr.

*Microhyla butleri* Boulenger, A. M. N. H. (7) vi. Aug. 1900, p. 188.

*Locality.* Larut Hills, Perak, 4000 ft. (A. L. Butler).  
Type.

## Fam. BUFONIDÆ.

## 11. BUFO JERBOA Blgr.

*Bufo jerboa* Laidlaw, P. Z. S. 1900, p. 889.

*Locality.* Gunong Inas ("Skeat Expedition").

*Previously known from* Borneo.

## Fam. PELOBATIDÆ.

## 12. LEPTOBRAHIUM PELODYTOIDES Blgr.

*Leptobrachium pelodytoides* Boulenger, Ann. Mus. Genova, (2) xiii. 1893, p. 345, pl. xi. fig. 3.

*Locality.* Larut Hills, Perak (L. Wray). Identified by Mr. Boulenger.

*Previously known from* Karin Hills.

## 13. LEPTOBRAHIUM HETEROPUS Blgr.

*Leptobrachium heteropus* Boulenger, A. M. N. H. (7) vi. Aug. 1900, p. 186.

*Locality.* Larut Hills, Perak, 3500 ft. (A. L. Butler).

Type.

*Note.*

RANA LATICEPS Blgr.—I have examined the frogs from Gunong Kledang, Perak, which Dr. Hanitsch recorded (Rep. Raffles Library & Museum, 1898) as *R. laticeps*, and I find they are in reality *R. hascheana* (Stol.). The claim of *R. laticeps* to a place on the Peninsula list depends, therefore, on a single specimen in the British Museum from Malacca (Mr. Hervey), and on Captain Flower's not quite positive identification of a specimen in bad condition in the Raffles Museum, from the same locality.

6. On some new Species of Earthworms belonging to the Genus *Polytoreutus*, and on the Spermatophores of that Genus. By FRANK E. BEDDARD, M.A., F.R.S.

[Received June 3, 1902.]

(Text-figures 46-54.)

The specimens which I deal with in the present communication form a part of the collection of these Annelids at the British Museum. Dr. Ray Lankester has been so good as to permit me to study these worms; and to him, as well as to Mr. E. A. Smith with whom I have corresponded on the matter, my thanks are due. The majority of the specimens were collected by Mr. S. L. Hinde in the Kenya District, at an altitude of 4000-4800 feet; a number of others, which also prove to be of considerable interest, were collected by Mr. Stuart Betton, in Lagari, British East Africa. The genus is limited in its range to Equatorial



East and Central Africa. There are at present twelve species known, of which eleven are characterized (from the original descriptions by himself and by myself) by Dr. Michaelsen in his "Oligochaeta" which forms Lieferung X. of 'Das Tierreich'<sup>1</sup>. To these I have recently added a twelfth species, also collected by Mr. Hinde<sup>2</sup>. I have now some observations to record upon new species. The first of these I shall name

(1) *POLYTOREUTUS KENYAENSIS*, n. sp.

This new species is one of the smaller forms, and agrees in its dimensions with *P. caeruleus* and *P. violaceus*. The large series of specimens which I have examined vary somewhat in dimensions; 100 mm. in length by 5 mm. in breadth were the measurements of an average specimen among the larger ones. The species is evidently a darkly coloured one; in the spirit the specimens were purplish brown dorsally. The prostomium is epicheilous, extending about halfway across the buccal segment.

The clitellum is completely developed round the body and embraces segments xiv.-xvii. inclusive with a portion of xviii. and sometimes of xiii.

The setæ, as is usual in this genus, are at unequal distances. The two setæ of the ventral couple are wider apart than are those of the lateral couple. The nephridiopores are only plainly visible upon the clitellar segments; they lie close to the anterior margin of the segment in a line with the ventralmost of the two lateral setæ.

The oviducal pores are obvious upon the xivth segment; they lie near to the posterior boundary of that segment and a little ventrally to the nephridiopores.

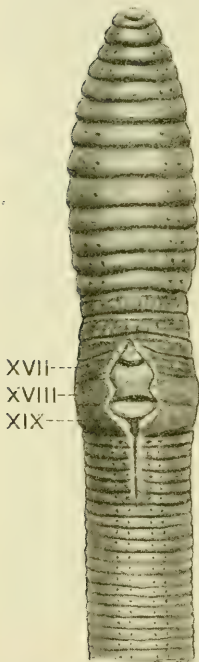
The most striking external feature of this species is shown in the accompanying drawings (text-figs. 46, 47). The male and female pores (to the description of which I shall return presently) lie on an area which is enclosed within a raised and lip-like fold which commences upon the sixteenth segment in front, and is continued back for a variable number of segments. Anteriorly upon the xvth segment and close to the front boundary of this segment, the folds of the right and of the left side nearly or quite coalesce; they then diverge to enclose the male pore and become again approximated upon the xviiiith segment and behind this pore. The larger spermathecal pore pushes the folds still further apart. Two or three segments behind this point the right and left folds again approach each other, but much more nearly, and they may even come into contact upon the last segments where they are developed, leaving merely a groove to indicate their original distinctness. This groove is generally closed posteriorly by an unpaired swelling of the integument. The whole area has thus very much the contour of a violin. I examined altogether

<sup>1</sup> Berlin, 1900, p. 412.

<sup>2</sup> "On some Earthworms from British East Africa, &c.," P. Z. S. 1901, i. p. 336.

75 fully mature examples of this species and found some variations in the extent of these lateral folds surrounding the genital area. The prevalent arrangement was that the area ended upon the xxivth segment; 29 specimens exhibited this character. But in nearly as many (24) these folds ceased to exist upon the xxiiiird segment. In 18 examples the folds were more extensive, reaching to the xxvth segment. The extreme in this direction was shown by one specimen only, where the groove extended as far as the xxvith segment. On the other hand, in three specimens this genital area stopped short at segment xxii.

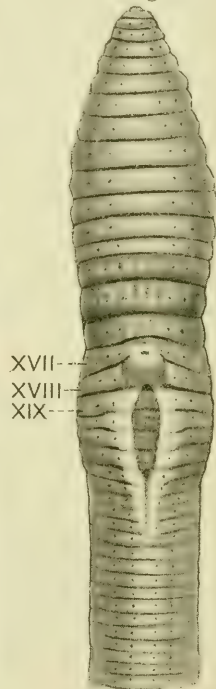
Text-fig. 46.



Text-fig. 47.



Text-fig. 48.



Text-fig. 46.—Ventral view of anterior segments of *Polytreutis kenyaensis*.

Text-fig. 47.—Ventral view of anterior segments of an individual of *Polytreutis kenyaensis*, with shorter perigenital area.

Text-fig. 48.—Ventral view of anterior segments of *Polytreutis montis-kenyæ*.

The segments which bear the pores are numbered.

The single and median male pore is upon segment xvii.

The single and median spermathecal pore is wider from side to side and lies upon the boundary line of segments xviii./xix.

As to the internal structure, it is mainly the female parts of the generative system which show differences from other species.

The septa dividing segments v./xi. are thickened. The dorsal vessel is single, and the last pair of hearts are in segment xi.

The gizzard lies in segment v. The system of calciferous glands appears to be quite as in other species.

In the xith segment are the dilated chambers which form the commencement of the single pair of sperm-ducts.

The sperm-sacs of *Polytoreutus kenyaensis*, as is the case with all other species of the genus, are but a single pair and are of very considerable length. In a worm measuring 9 mm. in length the sperm-sacs were 15 mm. long. As is the case with many other species of the genus, the sperm-sacs are divided into two regions: the anterior half is a thin slender tube, while the posterior half of each sperm-sac is swollen and deeply constricted where it passes through the septa. This latter region begins at about the xxivth segment and extends to the xxxviiiith. For three or four segments the slender sacs which form the anterior part of the sperm-sacs are also constricted where they traverse the septa. Latterly, the sperm-sacs show no signs of division into two sacs, they are completely blended for a tract which extends some little way forward from the posterior end.

The spermiducal glands are tubular and straight or a little coiled. I did not notice any marked division into two regions as in the spermiducal glands of *P. gregorianus*. There are here and there slight constrictions along the walls which produce irregular bulgings of the tube. In one case, and place, this bulging was so marked that the spermiducal gland ended in a bifid extremity. The large bursa into which both these glands open is more or less circular in contour.

The spermathecal apparatus appears to differ from that of any other species in that it has no diverticula. It commences anteriorly not far from septum xiii./xiv. and pursues a straight course to its point of opening on to the exterior between segments xviii./xix. It is a narrow tube and flattened against the ventral body-wall, being overlaid by the nerve-cord; at the posterior end it is wider for a short space before its external orifice. Anteriorly the sac ends blindly in a rounded extremity. Into this open the two oviducts directly, and not through the intermediary of diverticula of the sac as in other species of the genus. The oviducts are slightly coiled and, as usual, thick-walled and present a very different appearance from the spermathecal sac into which they open. Traced in the opposite direction, the oviducts pass to the exterior through a rounded thick-walled chamber which Dr. Michaelsen has called the "Eitrichterblase," to which is appended a receptaculum ovarum. The latter is very much larger than the Eitrichterblase from which the oviduct runs to the external pore. Several chambers packed with spermatozoa ("Samenkammerchen" of Michaelsen) are appended to the oviduct close to its exit from the receptaculum, as in many but not all species of *Polytoreutus*. I may observe that the oviduct is ciliated throughout, not merely that portion of it which passes from the receptaculum to the

exterior. As to the region which opens into the spermathecal sac, it seems to be an unnecessary periphrasis to call it, as Dr. Michaelsen does, a "Verbindungsschlauch." It is, to my mind, unquestionably the oviduct and corresponds exactly to that portion of the oviduct which in other Eudrilids (*e.g.* in *Stuhlmannia*<sup>1</sup>) opens directly into the spermathecal sac. Its cells are cubical and ciliated, and totally different from the long thin non-ciliated cells which line the spermathecal sac. Furthermore, there is no transition between the two kinds of cells that I could discover; and finally the oviduct opens by a slightly dilated mouth freely into the interior of the sac. This is, I take it, the oviducal funnel. I am inclined from these additional facts to add to the definition of the Eudrilidæ that the oviduct is characterized by the possession of two funnels, one of which opens into the receptaculum ovarum and the other into the spermathecal sac. The Samenkammerchen are, as Michaelsen their discoverer has pointed out, diverticula of the oviduct packed with spermatozoa arranged in a regular fashion. I am disposed to consider these diverticula as corresponding to the single diverticulum upon the oviduct which is to be found in *Hyperiodrilus*, *Heliodrilus*, and *Alvania*. Spermatozoa have not, however, so far been found to exist in the latter. I found spermatophores in the spermatheca, the description of which I postpone for the present.

(2) *POLYTOREUTUS MONTIS-KENYÆ*, n. sp.

This species has a considerable similarity to the last, which is chiefly due to the fact that the genital area is surrounded by a raised ridge not unlike that distinctive of *Polytoreutus kenyaensis*. The two species are nevertheless perfectly distinct. There are both external and internal differences of structure. *Polytoreutus montis-kenyæ* is, in the first place, a smaller and more slender species than its nearest ally. It has a length of 68 mm. and a diameter of 4 mm. In its colour (in spirit), form of prostomium, arrangement of setæ, position of nephridiopores, the present species appears to agree exactly with *P. kenyaensis*. The clitellum is also much the same; it always occupies segments xiv.–xvii., and occasionally strays a little way on to segments xiii. and xviii. Externally this species is to be distinguished from *P. kenyaensis* by the position of the male pore and by the perigenital area. The male pore lies intersegmentally between xvii./xviii. This fact could be positively ascertained only upon immature specimens, of which there are a good many. In the fully adult worm, the orifice in question is borne upon a smooth conical projecting papilla, more conspicuous in some individuals than in others, but always obvious. The actual orifice when particularly conspicuous is circular in outline. This papilla shelves down into the perigenital ridges, which in this species do not extend further

<sup>1</sup> Beddard, P. Z. S. 1901, vol. i. p. 354, text-fig. 87, *o.d.*



forward than the xviiith segment. This, as will be seen from a comparison of the drawings exhibited (*cf.* text-figs. 46 and 48, p. 192), is a striking difference between *Polytoreutus montis-kenyæ* and *P. kenyaensis*. The male orifice itself is not so conspicuous as in *P. kenyaensis*, and the female pore is much less so; it lies between segments xviii./xix.

The outline of the perigenital ridge is not so complete as in the last species. Anteriorly it is oval in contour, leaving a considerable ventral area of that shape between the two sides. The right and left folds approach each other gradually, and about the xxiiird segment are in practical contact, a furrow only being left between them. The shape of the genital area is thus more like a racquet than a violin. As I have already explained in the case of *P. kenyaensis*, the perigenital ridges of the present species are subject to some variation in their extent. But the mean about which the variation plays is a segment further back than in *P. kenyaensis*. In 26 individuals the ridges ended either upon segment xxv. or upon segment xxvi. Ten of these I refer to the latter category; but it is a little difficult to be accurate in drawing a hard and fixed line, since the groove sometimes ended upon the middle of the xxvith segment. I found no (mature) individual in which the genital area was of less extent; but in *one* specimen only it reached to the end of segment xxvii.

Text-fig. 49.

Ventral view of genital segments of *Polytoreutus montis-kenyæ*.

P, white cushion-like thickening.

The only other external character to which I have to call attention, is the very occasional presence of a white cushion-like thickening of limited extent in the ventral median line of segments xx. and xxi. I only observed this character to be well



developed in one individual which was not fully mature (text-fig. 49).

The internal anatomy of the genus *Polytoreutus* appears, so far as present observations go, to offer but little variation in the characters of the alimentary canal and the vascular system. I find that up to the xiith segment the structure of the present species is quite like that of its nearest ally. The sperm-sacs, moreover, are constituted upon exactly the same plan. In two specimens, one of the present species and one of *P. kenyaensis*, which I divided longitudinally and placed side by side for comparison, the dilated terminal region of the sperm-sacs reached back to precisely the same segment, *i. e.* the xxxviiiith. There is, however, naturally some variation in the extent of these sacs.

The spermiducal glands of the present species are relatively larger than those of *Polytoreutus kenyaensis*; otherwise their contours are much the same. They do not, however, open directly into a bursa propulsoria as in that species. The gland ends, in fact, in a duct of rather narrower calibre; the ducts appear to join, and in any case the bursa propulsoria is insignificant in its dimensions. That this would prove to be the case, is really indicated by the external characters; the, comparatively speaking, inconspicuous male pore does not suggest a large muscular terminal sac such as is suggested by and co-exists with the wide and broad external male pore of *P. kenyaensis*. The two drawings exhibited herewith (text-figs. 50, 51, p. 198) show accurately the relative dimensions of the bursa propulsoria in the two species. That of *Polytoreutus kenyaensis* is fully twice the size of that of the present species. These differences are of specific value; they have nothing to do with relative maturity. In both cases, a number of segments following the median generative pores have a much thickened body-wall. The ventral region of integument thus increased in thickness corresponds to the genital area dealt with in describing the external characters of the two species. The drawing (text-fig. 50, A, p. 198) shows the pre-eminent glandular nature of this area in *P. montis-kenyæ*, where contorted whitish masses of glandular substance have largely invaded the thickness of the integument. It may be finally pointed out that the external orifice and the lumen of the bursa propulsoria in *P. montis-kenyæ* looks forward; while in *P. kenyaensis* the direction is at right angles to the longitudinal axis of the body of the worm. The most remarkable feature, however, about the male efferent apparatus of this species is the existence of a small forwardly directed diverticulum of the spermiducal gland. This diverticulum has exactly the same appearance as the main gland, but is of less calibre: it receives the sperm-duct at its free apex. It joins the main gland just where the latter passes into its duct. This structure is not, however, new to the genus. Dr. Michaelsen has already recorded in *Polytoreutus arningi*<sup>1</sup> a perfectly similar

<sup>1</sup> "Neue u. wenig bekannte afrikanische Terricolen," J.B. Hamb. wiss. Aust. xiv.

structure; but these two species stand apart in this character from the remaining species of the genus *Polytoreutus*.

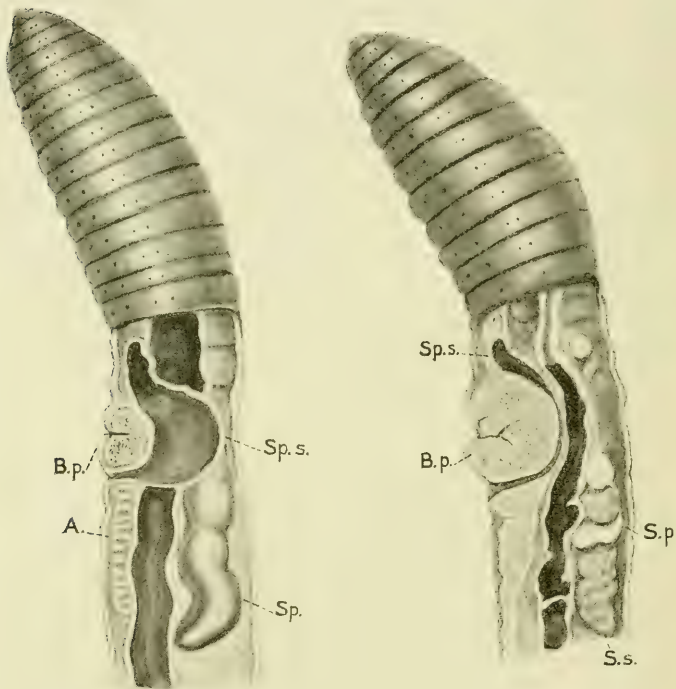
This condition appears to me to throw some light upon the curious structure of the corresponding glands in *Eudrilus*. In that genus, as has been abundantly shown by others as well as by myself, the spermiducal gland of each side is really formed by the close lateral fusion of two tubes, the fusion being merely a close apposition and retention within the same muscular sheath. The lumina are distinct, and the sperm-duct opens into one only of the closely joined tubes. Moreover, one of the tubes is distinctly longer than the other. My own recent investigations upon the spermiducal glands in the young *Eudrilus* seem to show that the division of the spermiducal gland is a secondary matter, for it is single and with but one lumen in the immature worm. It may be, however, that in *Polytoreutus* an originally double spermiducal gland derived from some *Eudrilus*-like form has split into its two component halves which have acquired independence. The double character of the male orifices and the female reproductive organs in *Eudrilus*, point to its being a more primitive type of Eudrilid than the, in many respects, highly modified *Polytoreutus*. In the present species the minute structure of the two parts of the "prostate" is identical, and the sperm-duct becomes continuous with the lumen of the diverticulum about one-third way down.

The female organs closely resemble those of *P. kenyaensis*. The spermathecal sac is single and median, and has no diverticula of any kind. At the posterior end it is, however, a little different from the spermathecal sac of the last species. The difference lies in the fact that the sac is humped up and bulged out a little way before the external orifice. Viewed laterally, the spermathecal sac is there S-shaped posteriorly. There is no question of diverticula. It is simply a dilatation of the sac itself. This region was packed with coagulated matter, which under the microscope was seen to consist entirely of coarse granules. I could find no trace of spermatophores. By the examination of several specimens I have convinced myself that the proximal widening of the spermathecal pouch of this species is a constant character, and distinguishes it from its ally *P. kenyaensis*. The contrast in this particular between the two species is clear from an inspection of the drawings exhibited (*cf.* text-figs. 50, 51, p. 198). Of this particular individual, I detached and made a series of sections of the anterior end of the spermathecal sac and of the egg-conducting apparatus. Though there were apparently no spermatophores in the posterior portion of the spermathecal sac, they were abundant anteriorly. The oviduct is furnished, as in the last species, with several diverticula lodging sperm. I have noted, however, the additional and interesting—if obviously to be expected—fact that free spermatozoa exist also along the course of the oviduct between the diverticula just referred to and the spermathecal sac. Their heads seem to be invariably in contact with the lining epithelium, the cilia of

which possibly attract them. I cannot therefore form an opinion as to the direction in which they were moving at the time of death. As in *P. kenyaensis*, the oviducts open straight into the median spermathecal sac at the two anterior corners.

Text-fig. 50.

Text-fig. 51.



Text-fig. 50.—Longitudinal section through genital segments of *Polytreutis montis-kenye*.

*A.*, ventral glandular area; *B.p.*, bursa propulsoria; *Sp.*, spermiducal gland; *Sp.s.*, spermathecal sac.

Text-fig. 51.—Longitudinal section through genital segments of *Polytreutis kenyaensis*.

*S.s.*, sperm-sac. Other letters as in text-fig. 50.

I have been able to note the histological characters of the epithelia at the point of contact. The sac is lined generally with a tall epithelium of granular appearance, the cells of which appear to break down at their free extremities to produce the granular matter with which the pouch is largely filled. At the slightly bulging corners (suggesting by their protuberance rudimentary diverticula of the median sac), where the oviducts open, the tall granular epithelium is underlain by a columnar epithelium which

is continuous with that lining the oviduct. At the sides this epithelium thins out and apparently disappears. Near to the orifice of the oviduct into the spermathecal sac, the tall granular cells disappear, so that there is a perfectly open oviducal funnel. At the actual opening of the funnel, the columnar cells are raised to form a lip surrounding the lumen. There can be no question therefore about the termination of the oviduct within the spermathecal sac in a funnel-like expansion. I could not, however, detect any cilia upon the epithelium.

(3) *POLYTOREUTUS BETTONIANUS*, n. sp.

Of this new species two individuals, of which one is fully adult, were collected at Lagari, British East Africa, by Mr. Stuart Betton. The worms were rather softened, so that the following account of their structure is not so full as it might otherwise have been.

The mature individual is incomplete at the posterior extremity; it measures 77 mm. by 5 mm. in diameter. The immature specimen is 93 mm. long. The colour (in alcohol) is of an uniform grey. The prostomium is procheilous, fitting into the concave anterior margin of the peristomial segment. The setæ show the usual arrangement met with in *Polytoreutus*. The clitellum occupies segments xiv.-xvii. entirely and about one-third of segments xiii. and xviii. The male pore is borne upon a prominent papilla and is intersegmental, xvii./xviii. The female pore lies between segments xviii./xix. There are no papillæ of any kind.

The alimentary tract and vascular system appear to be as in other species. The sperm-sacs of this species are unusual in their character. They are more normal speaking generally, but less normal for this particular genus *Polytoreutus*. In eight out of the twelve species already known and in the two species which have been dealt with in the present communication, the sperm-sacs commence as thin strands which pass back for a considerable distance before they acquire the more capacious dimensions usually associated with the sperm-sacs of earthworms. In *Polytoreutus bettonianus* the sperm-sacs are as wide at their commencement as they are in any part of their course. Coupled with this increase in diameter is a decrease in length. The sperm-sacs of the present species reach hardly further back than the point of opening of the spermiducal glands. The sperm-sacs are plump and sausage-shaped, of greater calibre than the spermiducal glands; they are marked by one or two deep constrictions. The two sperm-sacs are perfectly independent, and are not fused or even approximated posteriorly.

The spermiducal glands are about 14 mm. long; there is nothing remarkable in their form. Each gland is furnished with a narrower duct. A bursa propulsoria is practically absent. The female apparatus is constituted upon exactly the same plan as that of the two species just described. There is no bursa copulatrix. The spermathecal sac itself is single and median, without



any diverticula. Its calibre is rather greater than is the case with *Polytoreutus kenyaensis* and *P. montis-kenyæ*. Anteriorly the two oviducts enter it, and they are readily distinguishable from the pouch by their nacreous, indeed almost bronzy glitter, due, of course, to the thick muscular wall.

It may be convenient to embody the above-given descriptions in a short diagnosis of each of the new species of *Polytoreutus* dealt with in the present communication.

(1) *Polytoreutus kenyaensis*, n. sp.

Length 100 mm.; diameter 5 mm. Colour (in alcohol) purplish brown above. Prostomium epicheilous. Clitellum (xiii.) xiv.-xviii. Male pore xvii.; female pore xviii./xix. Genital area formed by two curved ridges meeting anteriorly on xvi. and posteriorly on xxiii.-xxvi. Sperm-sacs narrow and tubular anteriorly, wide and sacculated posteriorly, fused at extremity. Bursa propulsoria very large; spermiducal glands without duct. Spermathecal sac without diverticula; oviduct with sperm-holding diverticula; no bursa copulatrix.

*Hab.* Mt. Kenya region, Brit. C. Africa.

(2) *Polytoreutus montis-kenyæ*, n. sp.

Length 68 mm.; diameter 4 mm. Colour (in alcohol) purplish brown above. Prostomium epicheilous. Clitellum (xiii.) xiv.-xviii. Male pore xvii./xviii.; female pore xviii./xix.† Genital ridges commencing at male pore and ending on one of segments xxv.-xxvii. Sperm-sacs narrow and tubular anteriorly, wide and sacculated posteriorly, fused at extremity. Bursa propulsoria very small; spermiducal glands with short anterior branch receiving sperm-duct and with slender duct. Spermathecal sac without diverticula; no bursa copulatrix.

*Hab.* Mt. Kenya region, Brit. C. Africa.

(3) *Polytoreutus bettonianus*, n. sp.

Length about 100 mm.; diameter 5 mm. Colour (in alcohol) grey. Prostomium procheilous. Clitellum xiii.-xviii. Male pore xvii./xviii.; female pore xviii./xix. Sperm-sacs of uniform, wide diameter throughout. Spermiducal glands with duct. Bursa propulsoria very small. Spermathecal sac without diverticula. No bursa copulatrix.

*Hab.* Lagari, Brit. E. Africa.

*On the Compound Spermatophores of Polytoreutus.*

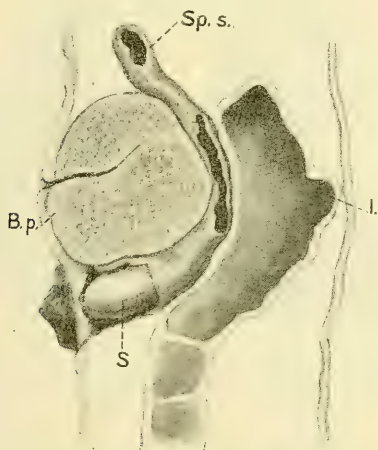
In a communication made to this Society in 1901<sup>1</sup> I dealt with the spermatophores of *Polytoreutus magilensis*, *P. violaceus*, and

<sup>1</sup> "On some Earthworms from British East Africa, &c.," Proc. Zool. Soc. 1901, vol. i. p. 340.



*P. hindei*, the only species in which, so far as I am aware, any structures of the kind have been met with or described. It may, I think, be admitted that in this genus *Polytoreutus* the spermatophores are very much like those of the Tubificidae, and that they occur in two forms distinctive of different species of that genus. An examination of the species of *Polytoreutus* which I have named *P. kenyaensis* and *P. montis-kenyae* has shown that the same kind of spermatophores exist, but not in great abundance, in the spermathecal sac. These spermatophores in *P. kenyaensis* are of the type characteristic of *P. magilensis*, but are smaller and more slender than in the much larger species *P. magilensis*. The spermatophores, when present, were found in the region of the spermatophore nearest to the external orifice. I never observed

Text-fig. 52.



Longitudinal section through the spermathecal sac and the adjacent region of *Polytoreutus kenyaensis*.

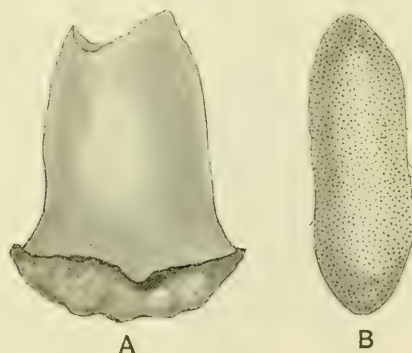
I., intestine; S., spermatophoral case. Other letters as in text-fig. 50.

them to be so localized in position in the other species where these bodies occur. I failed to find in the present species, as I also failed to find in *Polytoreutus magilensis*, any indication that the spermatophores are immature forms of the same bodies in the species *P. montis-kenyae*, *P. violaceus*, and *P. hindei*, in which two latter, it will be recollected, the chitinous sheath forming the wall of the spermatophore is much thicker. These additional facts, therefore, strengthen my earlier contention that there are two different forms of spermatophore in this genus. These facts, however, are not, so far as concerns *P. kenyaensis*, all that is to be said with respect to the spermatophoral apparatus in that species. In a few individuals out of a large number which I

examined, the wide mouth of the spermathecal sac was seen to be blocked by an irregularly crinkled mass of a brownish-yellow colour. The appearance presented was of a number of earth-particles adhering to the orifice in question. This, however, proved to be not the case; for it was possible to seize hold of the irregular mass with the forceps and draw it out of the spermathecal sac. It has then somewhat the form of an acorn (text-fig. 52) and was of about the size of a grain of millet.

When the spermathecal sac is cut open, the single spermatophore-case was seen to entirely fill the cavity of that sac, which is indeed stretched to contain it. The end of the case protruded a little way beyond the mouth, and this free end was the irregularly shaped brownish-yellow mass seen on an external inspection to

Text-fig. 53.

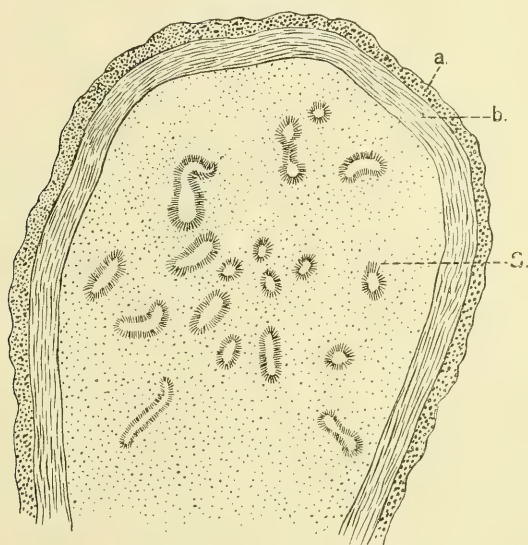


Spermatophoral case of *Polytoreutus kenyaensis*: (A) removed from spermathecal sac; (B) its contents (a mass of sperm-ropes) removed entire.

block the mouth of the sac. The part lying within the sac was smooth in appearance but hard to the touch; it gradually diminished in calibre to the end lying furthest from the mouth of the spermathecal sac. The exact measurements of the entire body were 2 mm. It seemed quite clear, even on a naked-eye inspection, that this body must be a spermatophore (text-fig. 53) (or perhaps a parasite) lying within the spermathecal sac. A study of its histological character appears to prove conclusively that this is the proper interpretation of the case. It is doubtful, however, whether it is permissible to call this body a spermatophore, seeing that the thin worm-like bodies which I have already described in this genus and in the present species seem to merit that name. We may, however, leave the consideration of this matter until after describing the histological characters of this case imbedded in the lumen of the spermathecal sac. The hard consistency of this body caused some little difficulty in procuring entire sections. However, I have not found it impossible to piece together mentally the

somewhat broken sections which were brought about by the brittleness of the walls. In longitudinal section (text-fig. 54) the case showed an oval contour, and it was nearly completely filled by a plug of matter with the following constitution:—The matrix, so to speak, of the no doubt fluid contents—fluid, that is to say, during life—was formed of granules of various sizes, which have not absorbed the borax-carmines with which the entire spermatophore had been stained. The spermatophore was not submitted for more than half an hour to the staining fluid, but in that time the spermatozoa within the case had been deeply tinted. But, as I have remarked, the granular matter was not so stained, and is therefore

Text-fig. 54.



Section through apex of spermatophoral case of *Polytoreutus kenyaensis*, highly magnified.

*a, b*, two layers of chitinous case; *s*, sperm-rope imbedded in granular matter.

evidently to be regarded as a different substance from the imbedded spermatozoa. It is not, for example, composed of nucleated cells; or so at least it might be inferred from its non-staining qualities. The nature of this substance seems to me to be probably identical with that of the substance forming the walls of the spermatophore. I shall deal with the two together. Imbedded in this granular mass are the spermatozoa. These are not, however, loose and free from each other as in the case of the contents of some other spermatophores—for example, those of the genus *Stuhlmannia*. They consist of the regular bundles of spermatozoa which I have already referred to as “spermatophores.” In sections these were

seen to be cut across in various directions, and it is plain therefore that they lie irregularly within the cavity of the spermatophore-case. The heads of the spermatozoa, where they are attached to the granular core, show a deep staining. The core itself is unstained. These sperm-ropes have no connection with the walls of the case which contains them. The latter hardly shows a definite structure in its walls, which appear from their hardness to be of a chitinous consistency. The region of the case which lies furthest away from the external orifice of the spermathecal sac has a, relatively speaking, thin wall which is divisible into two layers. The outermost layer is apparently softer than the inner layer and is darkly stained; it has a granular appearance. The inner layer is stratified longitudinally, in a direction, that is to say, parallel to the long axis of the case. It is but slightly stained, but it has a granular aspect; and here and there are darkly stained particles within its walls. At the base, the part which corresponds to the "cup" of the acorn, the walls are very thick indeed, so much so as to leave the barest chink in the way of a lumen leading to the exterior of the case. At the opposite extremity, I should say, the case is perfectly closed, and has no communication with the interior of the spermathecal sac. Where the walls are thick the process of cutting the sperm-case into sections has broken up the walls here and there into parallel strips running parallel again to the long axis of the case.

So much for the structure of the spermatophores and the enclosed sperm-ropes in *Polytoreutus kenyaensis*. In the allied *P. montis-kenyæ* the conditions were different. In none of the specimens which I examined—and these were numerous, though not so numerous as of *P. kenyaensis*—did I observe any large spermatophore lying within the spermathecal sac at the mouth. On the other hand, the interior of the spermathecal sac near to its blind end was occupied by a large number of spermatophores of the type already stated to exist in the species *Polytoreutus violaceus* and *P. hindei*. These spermatophores, that is to say, are of the same form as in *P. kenyaensis* and *P. magilensis*, but are larger and thicker, the increased size being mainly due to the fact that the heads of the spermatozoa are covered externally with a refracting and non-staining chitinous coat, which is absent in the more slender sperm-ropes of the other two species. I think that it will be convenient to retain the term sperm-ropes for the agglutinated spermatozoa of *P. kenyaensis* and *P. magilensis*, and to call spermatophores these more thoroughly finished off structures in *P. violaceus*, *P. hindei*, and *P. montis-kenyæ*. It seems to me also that the use of these different terms will serve to emphasize an essential difference between these two kinds of masses of agglutinated spermatozoa. In *P. montis-kenyæ* each mass of spermatozoa has its own chitinous case; in *P. kenyaensis* a large number of sperm-masses are enclosed within the same case. There is an analogy here with the cocoons of the Oligochæta. In some forms the cocoon contains but a single egg; in others a



considerable number are to be found in the same cocoon. Whether future investigation will show that *P. magilensis* has a large spermatophore like *P. montis-kenyæ* remains to be seen; but in the meantime I may point out that that species agrees with *P. kenyaensis* in the very conspicuous character of the spermathecal pore; while in those species with numerous and small spermatophores the external orifice of the sperm-sac is not so conspicuous.

In a former paper dealing with the spermatophores of this genus<sup>1</sup>, I found myself unable to suggest the place of origin of these structures. I believe that I am now able to fix this with some probability. Were the spermatophores or sperm-ropes constructed by the activity of the spermiducal glands, the spermathecal sacs would only contain spermatophores or sperm-ropes already fully formed. This, however, is not the case; there are abundant and free spermatozoa, as I have already mentioned, in the diverticula of the oviduct and along the course of the latter up to and in the spermathecal sac itself. In my description of *Polytoreutus magilensis* I pointed out that free spermatozoa were to be found at the distal end of the spermathecal sac and not near to its mouth<sup>2</sup>. I have met with precisely the same thing in the present species. At the blind end of the spermathecal sac are numerous masses of free spermatozoa, generally in contact with a quantity of the granular matter which fills the pouch.

The facts lend themselves, indeed, to the hypothesis that the sperm from another individual gains access to the spermathecal sac, not by direct transference through the mouth of that sac, but through the oviducts, whose external pores are after all large and conspicuous, and quite as marked as are the external apertures of the spermathecae in many other Oligochaeta. At present, however, this view is not in the least pressed, for we are totally ignorant of the mode of copulation in these creatures. Again, if the spermathecal sac were a mere storage-house for the spermatophores, we should hardly expect it to be lined with the kind of epithelium which actually forms the lining of that chamber. The cells are long and granular, and at their free ends give off a loose granular secretion, into which indeed they appear to break up. In the spermathecal sac of an example of *Polytoreutus kenyaensis*, in which the mouth of the sac was plugged by no spermatophore, the sac was much occupied by actual cells which had wandered off from the lining epithelium. I take it that these later break down to form the granular matter already referred to. This granular matter in *P. montis-kenyæ* was seen to close round the spermatophores, and its appearance was quite indistinguishable from the chitinous (?) case of the small spermatophores. In some instances no demarcation could be drawn between the granular matter filling the pouch and that portion of it immediately surrounding

<sup>1</sup> "On some Earthworms from British East Africa; and on the Spermatophores of *Polytoreutus* and *Stuhlmannia*," P. Z. S. 1901, vol. i. p. 340.

<sup>2</sup> "Two new Genera and some new Species of Earthworms," Quart. Journ. Micr. Sci. vol. xxxiv. (n. s.) p. 252.



the mass of spermatozoa and forming the wall of the spermatophore. I cannot but think that the sac-secretion is responsible for the formation of the large case in which the sperm-ropes of *Polytoreutus kenyaensis* are contained. In support of this view, I may further cite the observations of Nasse<sup>1</sup>, who found in *Tubifex* that the epithelium lining the spermatheca breaks down into a fluid or semi-fluid matter which may very possibly give rise to the coat of the spermatophore. I may finally point out that the existence of the large spermatophore of *P. montis-kenyae* is on the whole not unlike the spermatophore of *Stuhlmannia*, the only other genus of Eudrilidae in which up to the present spermatophores have been described. There are differences in detail, but in both the case is thicker at its open end, which lies next to the orifice of the spermathecal pouch, and the walls show a granular structure, suggestive of their origin from the breaking-down of the cells which constitute the lining membrane of the spermathecal sac.

#### *Note on the Ovaries of Polytoreutus.*

Although the ovaries in this genus have been already discovered by Michaelsen, there remain a few points connected with their relation to the efferent apparatus which have not yet been cleared up; at any rate, the descriptions of Dr. Michaelsen do not quite apply to the species which I have studied. The observations which I now record were made upon immature examples of *Polytoreutus montis-kenyae* or of *P. kenyaensis*. In any case, the examples were collected with these two species and preserved in the same bottle with them. The possibility exists that they are the young of another species. I am not aware that this point can be settled. The earliest suggestion of the position of the ovary proves to have been wrong. Michaelsen<sup>2</sup> located it in the end of the diverticulum of the spermathecal sac, where the latter communicates with the oviduct. The next description of this part of the reproductive system was by myself<sup>3</sup>, and is, as I now believe, not wholly correct. In *P. violaceus* some "small rounded cells" were noted in a sac attached to the spermathecal pouch where it comes into contact with the septum dividing segments xiii./xiv. As none of the cells were mature, it was impossible for me to be certain that this heap of cells was really the gonad; and I did not succeed in observing any connection of the sac involving the ovary with other regions of the egg-conducting apparatus. The small sac, containing what were presumed to be germinal cells, was connected with the septum by a strand of fibrous tissue. So far, therefore, the description was in agreement with that of

<sup>1</sup> "Beiträge zur Anat. der Tubificiden." Inaug.-Diss., Bonn, 1882.

<sup>2</sup> "Beschreibung der von Herrn Dr. Fr. Stuhlmann auf Sansibar und dem gegenüberliegenden Festlande gesammelten Terricolen," JB. Hamb. wiss. Anst. ix. (1) p. 39.

<sup>3</sup> "A Contribution to our Knowledge of the Oligochaeta of Tropical Eastern Africa," Quart. Journ. Micr. Sci. xxxvi. (n. s.) p. 235.

Michaelsen<sup>1</sup>, save that the gonad cells, instead of being within the spermathecal sac, were in a special sac closely adpressed to its walls. The next description of this gonad is by Michaelsen. In an account of several new species of the genus, Michaelsen has put on record certain facts about the ovary and its relations to other parts of the generative system. This paper contains the first positive and undoubted description of the ovary itself. In *P. usindjaensis* there is a sac ("Ovarialblase") attached to the loop of the oviduct, which Michaelsen has termed the "Eitrichterblase"; in the cavity of this are germinal cells, some of which are nearly mature ova. This is plainly shown in his figure<sup>2</sup>. As to the connections of this sac, the author expresses himself as follows:—"Das durch das Ovarium fast ganz erfüllte Lumen der Ovarialblase setzt sich in einen Kanal fort, über dessen inneres Ende ich mich nicht ganz genau orientiren könnte. Entweder tritt der Ovarialkanal in das Lumen der Eitrichterblase ein, nahe der Stelle, an der auch der Kanal des Receptaculum ovarum in dasselbe einmündet, oder vereint sich auch direkt mit diesem letzteren Kanal." It should be added that Dr. Michaelsen also figures a strand of connective tissue, as he has already done in *P. cœruleus*, attaching the ovarian sac to the parietes. In *P. kiri-maensis* the conditions appear to be a little different. The ovary is contained in a narrow sac, which communicates by a narrow duct with the branches right and left of the spermathecal sac, near to where the oviduct also opens into that sac.

*P. arningi* is again different. In this species<sup>3</sup> there are apparently huge ovarian sacs which communicate medianly with each other. These narrow towards the septum xii./xiii., and it is here that Michaelsen would place the ovaries, though he was unable to bring forward any exact evidence of the existence of these gonads. No communication was traced between the ovarian sacs and any other part of the egg-conducting sacs and ducts.

It appears, therefore, that there are some differences between the various species of this genus *Polytoreutus* in respect of the relation of the ovaries to the rest of the female generative system. These differences may be possibly referred to two categories; and if so, it may be ultimately desirable to subdivide the genus. For in the species which possess a bursa copulatrix one arrangement prevails, and in the rest, as it appears to me, another. It is especially to the latter that I wish to draw attention in the present communication. I find that in the species examined by myself, the gonads and the ducts are probably to be compared exactly with the species *P. violaceus*, *P. cœruleus*, and *P. usindjaensis*. If this be so, then the ovary has not, up to the present, been discovered in those species. I have examined two stages in the development of the gonads and their ducts in *Polytoreutus*, one of which is

<sup>1</sup> "Die Regenwürmer Ost-Afrikas," in 'Deutsch-Ost-Afrika,' p. 16 &c.

<sup>2</sup> *Loc. cit.* pl. i. fig. 10.

<sup>3</sup> "Neue und wenig bekannte afrikanische Terricolen," JB. Hamb. wiss. Anst. xiv. p. 56.

much younger than the other, though outwardly no differences were to be detected. In the youngest stage the ovaries are plain, and completely fill two sacs situated on either side of the nerve-cord and at some little distance from it. These sacs are evidently those which Michaelsen discovered in *P. kirimaensis*. They also correspond exactly to the similar sacs in *Eudrilus*, in some young stages of which the sacs in question are closed sacs and have no outlet; later, of course, as is well known, they communicate with the spermathecal sac. Furthermore, these ovarian sacs, as they may be conveniently termed, correspond exactly to sacs involving the testis of each side in segment xi. I shall deal more at length with the points of likeness presently. Into each sac opens the oviduct by a conspicuous funnel, which has precisely the relations to the ovarian sac that the sperm-duct funnel has to the testicular sac (seminal sacs, sperm-reservoirs) in the same worm. Moreover, the course of the oviduct, which in this young stage has not reached the exterior, is exactly similar to the course of the sperm-duct. In both cases the funnel opens into the sac towards the centre of the body, and the duct bends sharply upwards and ceases at the body-wall at a precisely corresponding spot. The ovarian sac is not only continuous with the funnel of the oviduct. Its lumen is perfectly continuous with that of the spermathecal sac; the latter, however, in this very young specimen, is in a state of immaturity. It consists of a median sac as usual which contains no lumen; it is of inconspicuous dimensions, and runs for a short way beneath the nerve-cord. Its lateral branches, as has been said, open into the ovarian sac, and these branches have therefore for a certain distance a lumen. The development of the spermathecal sac is then, as it appears, from before backwards. I could find no trace of a receptaculum ovarum as distinct from the chambers of a coelom already mentioned; and in any case the packing of the ovarian sac with a plug of germinal cells and developing ova shows that the time for the transference of the latter to a receptaculum was not yet ripe, and none of the ova were approaching maturity.

The existence of but one funnel seems to show that the existence of the funnels in the adult is simply a question of the division and pulling out of one branch of the single funnel. Furthermore, the fact that the ovarian sac communicates freely with the spermathecal sac, and that the receptaculum ovarum is formed later, shows that the communication in the adult between the ovarian sac and the one or the other of these two sacs is only a difference of secondary importance due to the different times at which the several cavities cease to communicate with each other. In the older stage, the relations of the various parts of the egg-conducting apparatus were further advanced and naturally different. The ovarian sac contained no ova or germinal cells at all; these are transferred *en masse* to the receptaculum, probably as the latter is formed. But the sac itself is quite evident, and communicates by a narrow chink, not at all conspicuous, with the

egg-sac. There is also an outgrowth of the ovarian sac into the thick muscular walls of the oviduct, to form a cavity which is that figured by Michaelsen in *P. usindjaensis*<sup>1</sup>, and which is therefore, as I think, not the "Ovarialblase." This sac does not in its turn communicate with either the receptaculum or the spermathecal sac. I take it, however, to be—but this is purely theoretical—the part of the originally single cavity which is in communication with the spermathecal sac, the communication being cut off as the latter grows. There is in addition another comparison that may be made. In the case of the male organs the testicular sacs (seminal reservoirs) are, as I have mentioned, the exact homologues of the ovarian sacs, and both of them communicate with each other. The long sperm-sacs arise as an outgrowth of the septum, and their cavity communicates, not with the general coelom of segment xi., but with the interior of the seminal reservoirs, which at that point are in contact with the posterior wall of their segment. The orifice of communication is a minute one, and immediately median of it is an ingrowth of the testicular sac into the thickness of the very thick septum which divides segments xi. and xii. The appearance of this prolongation of the testicular sac is exactly that of the prolongation of the ovarian sac just referred to; and I cannot help considering that both cavities are homologous. It would then possibly be a vestige of the spermathecal apparatus appended to the female system, the receptaculum of the latter being of course represented by the sperm-sacs. I would reiterate, however, that this is merely a suggestion. But that there is the actual likeness is a fact. Dr. Michaelsen<sup>2</sup> has figured a strand of "connective tissue," attaching the thickened muscular walls of the oviduct to the parietes of segment xiii. This structure exists in the worm examined by myself, but it traverses the wall of the xiiiith segment and is attached to the posterior wall of segment xii.

It is not, as it might be supposed to be, a vestige of the canal connecting the cavity of the ovarian sac with that of the other parts of the egg-conducting apparatus. It is simply a thickening in the muscular attachments of the oviduct to the septa, comparable—I take it—to the "tendons" which tie the septa of this and other earthworms to the parietes: the muscular and heavy oviduct requires apparently some such fixed point. I may remark that in the worm whose immature reproductive organs I have just dealt with were germinal cells some way down the spermathecal sac, thus showing that there must have been in this specimen a communication between the ovarian sac and the spermathecal sac such as exists in younger stages. A final point to which I desire to draw attention is the fact that in the young stages the median spermathecal sac has two lateral branches, one on each side, into which the oviducts open on the one part. In the adult worm, as I have already mentioned, the spermathecal sac has no branches,

<sup>1</sup> "Regenwürmer," in 'Deutsch Ost-Afrika,' pl. i. fig. 19.

<sup>2</sup> *Ibid.* pl. ii. fig. 20 bis.



but the oviducts open one on each side of the single median sac. The arrangement with lateral branches is the most common one among the species of the genus *Polytoreutus*; and it is interesting to find them recapitulated in the young of *Polytoreutus montis-kenyæ*, whose adults have not the branches in question.

7. On the Sponges collected during the "Skeat Expedition" to the Malay Peninsula, 1899-1900. By IGERNA B. J. SOLLAS,<sup>1</sup> B.Sc. (Lond.), Bathurst Student, Newnham College, Cambridge.

[Received May 15, 1902.]

(Plates XIV. & XV.<sup>2</sup>)

These Sponges were kindly entrusted to me for description by Dr. S. F. Harmer, F.R.S. They were obtained by Mr. R. Evans, of Oxford, by shore-collecting in two localities:—“(i) Pulau Bidang, one of the Nine Islands group, off the coast of Kedah on the west coast of the Malay Peninsula, running N.E. from the Island of Penang; (ii) Great Redang coral islands off the coast of Trengganu State (S. of 5° 50' N.), which again is S. of Kelantan, the largest of the East-coast States.” Thus, being a shore collection, the majority of the species represented in it belong to the group Monaxonida; the remainder are Tetraxonia and Keratosa.

In dealing with the representatives of the simpler Monaxonida I have contented myself with mere description, leaving the species undetermined. In the present state of classification of these species this seems to be the only satisfactory course open to any worker not prepared to make an exhaustive study of all the species of a genus.

#### MONAXONIDA.

##### 1. RENIERA sp. (Plate XIV. fig. 5.)

Sponge growing on the back of a crab, of which it conceals completely the dorsal view.

Consistency gelatinous. Measuring from 1 to 2 cm. across.

Spicules slightly bent oxeas, 0.075-0.090 × 0.003-0.004 mm.

Spongin abundant at the nodes of the spicular network. The mesh is square. Single spicules project vertically from the dermal membrane.

In one of the two specimens in the collection, but not in the other, there are a few multispicular strands in the otherwise very regular unispicular meshwork.

Pulau Bidang and Great Redang.

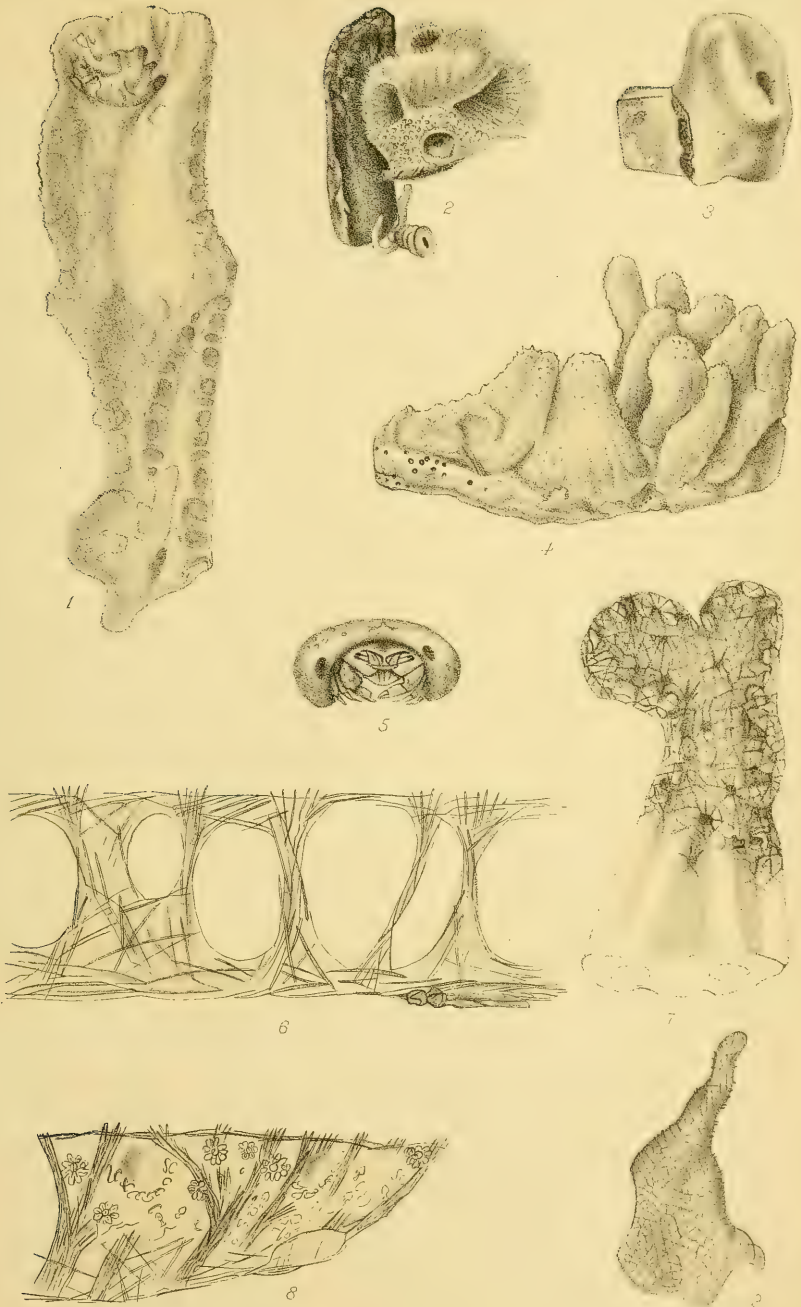
##### 2. RENIERA sp. (Plate XV. fig. 11.)

Sponge encrusting, growing on an encrusting Polyzoon and forming a thin sheet from 1-2 mm. in thickness. Oscula

<sup>1</sup> Communicated by Dr. S. F. HARMER, F.Z.S.

<sup>2</sup> For explanation of the Plates, see p. 221.

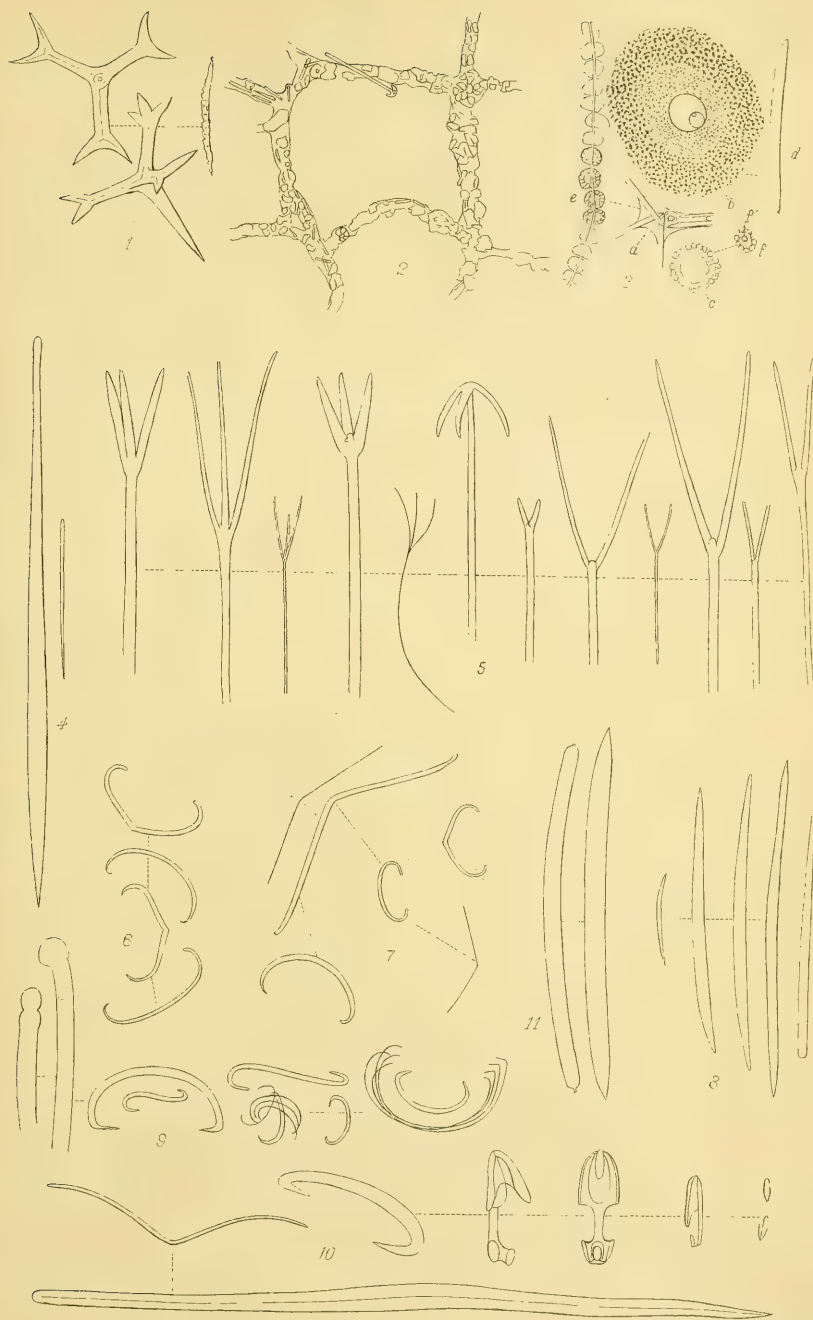




*Edwin Wilson, Cambridge.*

SPONGES FROM THE MALAY PENINSULA.





Edwin Wilson, Cambridge.



numerous, with raised margins, almost regularly arranged at distances of 5 mm. from one another. Pores large, conspicuous.

Skeleton composed of multispicular main fibres connected by a unispicular network. The main fibres run vertically, and their projecting distal ends raise the dermal membrane into small prominences.

Spicules, oxeas with gradually tapering ends or with rounded end from which a short point projects,  $0.12-0.13 \times 0.007-0.008$  mm.

Great Redang.

### 3. RENIERA sp.

A pink sponge forming irregular encrusting lobes. Oscula about 1.5-2 mm. in diameter.

Skeletal network with one or two spicules to the mesh. Dermal membrane smooth, pores fairly conspicuous.

Oxeas  $0.10-0.11 \times 0.0056$  mm.

Embryos are present in the basal parts of the sponge, having a skeleton of scattered fine oxeate spicules.

Pulau Bidang.

### 4. RENIERA sp.

Sponge ear-shaped, encrusting, thickest in the neighbourhood of the single large osculum, which is marginal. Compact, brittle. Colour, when fresh, grey.

Dermal membrane smooth. Pores visible, largely in rows. Main fibres multispiculate; spongin fairly plentiful.

Oxeas  $0.098 \times 0.002$  mm. to  $0.13 \times 0.007$  mm.

Pulau Bidang.

### 5. RENIERA sp. (Plate XV. fig. 3.)

Two small fragments of a sponge of gelatinous consistency. Colour pinkish grey. Oscula from 1-3 mm. in diameter. Surface smooth, pores not obvious.

Spongin abundant, forming considerable swellings at the nodes of the unispicular mesh and occasionally completely enveloping the spicules along their whole length.

"Reniera filaments" and "chaplets" are present.

Spicules slender oxeas with somewhat blunt points,  $0.08-0.09 \times 0.003$  mm.

Great Redang.

### 6. RENIERA sp.

Sponge consisting of creeping branches attached at intervals, sometimes 5 mm. thick, sometimes forming quite a thin crust. Texture compact and resistant. Oscula 2 mm. in diameter with slightly raised thin margins.

Mesh unispicular, with some stout multispicular strands, having as many as 8-10 spicules on a cross section. Dermal membrane smooth, rather easily detached.

Oxeas bent, stout,  $0.87-0.94 \times 0.005$  mm.

Pulau Bidang.



The specimen is bottled with two specimens ( $\sigma$  &  $\varphi$ ) of a decapod crustacean without remark, presumably they were found sheltering under it.

7. *RENIERA* sp.

Sponge tubular, creeping, branching and again anastomosing, swollen at intervals where it bears oscula of about 2 mm. in diameter. Pores large, conspicuous, and fairly evenly distributed.

The skeleton is rather irregular, with multispicular strands connected by a network which is not at all uniform, being either uni- di- or tri-spicular. The multispicular fibres raise the dermal membrane into minute conuli.

The tissues are permeated with black pigment-containing cells, which have a number of refractive granules over their surfaces.

Oxeas  $0.14 \times 0.007$  mm.

Pulau Bidang.

8. *GELLIUS CENTRANGULATUS*, n. sp. (Plate XV. fig. 6.)

Sponge massive, fragile, attached by a broad surface. Dermal membrane easily removed. Oscula (?) in rows.

Skeleton a regular unispicular network with rather abundant yellow-brown spongin at the nodes. The spongin occasionally completely invests the spicules of the net. Here and there multispicular strands occur.

The interest of the species lies in its microscleres: besides sigmata of the usual form it possesses others with a central bend giving them an appearance very like that of a centractinate sigma that may perhaps be termed centrangulate (Pl. XV. fig. 6). These curious bow-like sigmata recur in *G. sagittarius* (Pl. XV. fig. 7)<sup>1</sup>.

Oxeas  $0.22 \times 0.007$  mm. The oxeas show frequent abnormality in that they bear lateral branches.

Sigmata  $0.016-0.0195$  mm. Centrangulate sigmata  $0.0195$  mm.

Great Redang.

9. *GELLIUS SAGITTARIUS*, n. sp. (Plate XV. fig. 7.)

Sponge attached, consisting of a more dense basal part and of numerous slender tubes arising from this.

In one specimen these tubes anastomose; in the second they are broken off and show no indication of how they were arranged.

Skeleton a more or less irregular network of oxeas, becoming especially so in the lower part of the sponge, where the arrangement of spicules is almost halichondroid.

Oxeas  $0.3-0.35 \times 0.01-0.013$  mm.

Abnormalities among the oxeas are striking by their frequency. They consist in the possession of small branches at one end of the spicule, sometimes a single one is borne laterally, or there may be 3 or 4 or more pointing in various directions or forming a regular tuft.

<sup>1</sup> Since this paper was read the translation of Lundbeck's essay on the Sponges of the Danish Ingolf Expedition has appeared. Similar sigmata are there figured and described in *Gellius luridus*, n. sp.

Sigmata 0.012–0.016 mm.; centrangulated sigmata 0.016 mm.  
Toxa: arms 0.025, 0.016; length 0.049 mm.  
Pulau Bidang.

10. *ESPERELLA SULEVOIDEA*, n. sp. (Plate XIV. figs. 8 & 9 and Plate XV. fig. 10.)

Sponge creeping, attached at intervals, the attached parts forming thin disks.

The skeleton consists of short stout fibres of styles rising from the surface of support and almost at once breaking up into 3 or 4 compact branches which run to the dermal membrane, through which they pass, their ends forming little hispid patches on the surface which are visible to the naked eye. The dermal membrane contains a network formed of compact multispicular fibres. In the meshes of this main framework lie the various forms of microscleres. The rosettes of anisochelæ are mostly confined to the superficial parts of the sponge.

Spicules:—

Tylostyles, with but slightly marked head, and with a peculiar undulating outline:  $0.360 \times 0.012$  and  $0.360 \times 0.006$  mm.

Sigmata  $0.06-0.08 \times 0.006$  mm.

Toxa 0.5–0.14 mm.

Anisochelæ in rosettes, 0.05–0.06 mm.

Anisochelæ scattered, 0.033 mm.; 0.012 mm.

11. *BIEMMA DEMOCRATICA*, n. sp. (Plate XV. fig. 9.)

Sponge growing on a Lamellibranch shell and forming very thin encrusting sheets. The microscleres are in striking predominance over the megascleres, which might almost pass unnoticed. The microscleres are sigmata of many sizes, ranging from 0.01 to 0.08 mm.; they are frequently fascicled, and in this case they may be either linear or, as is more commonly the case, they may be of the same thickness as solitary sigmata of the same length. The few megascleres are tylostyles often bent rather sharply just below the head, or sometimes with a second swelling immediately succeeding the head.

Tylostyles  $0.18 \times 0.0025$ , head .005;  $0.26 \times 0.06$ , thickness of head .008;  $0.56 \times 0.006$  mm., thickness of head 0.009 mm.

Sigmata  $0.08 \times 0.003$  mm. to 0.01 linear.

I have included this species in the genus *Biemma* with some hesitation. Possibly it ought to form the type of a new genus.

Pulau Bidang.

12. *DESMACELLA FORTIS* Topsent.

*Desmacella fortis* Topsent, Revue Suisse de Zoologie, iv. 1896–7.

With this species from the Red Sea and Bay of Amboina are identified two specimens differing somewhat in external features. Each is greyish in spirit, but has coloured the spirit in one case violet, in the other pink.

The chief difference between the specimens is in the size and position of the oscula. In the violet-coloured specimen (which is

also the larger, measuring 8 cm. in height and 26 cm. in circumference, while the pink sponge is 7 cm. in height and 10 cm. in circumference) the oscula agree with Topsent's description. They are large—3–6 mm. in diameter,—confined to the upper surface of the sponge, and sometimes at the end of chimney-like projections which only need to fuse laterally with one another in order to give Topsent's dorsal crest. In the pink sponge the oscula are no more than 2 mm. in diameter, and are scattered on all the free faces of the sponge and lie quite level with the general surface.

Both specimens seem to have incorporated in themselves any foreign bodies lying on them. The canals of both are inhabited by 6-rayed Ophiuroidea in various stages of fission, or rather of regeneration following fission, one half of the disk and three arms being of much smaller size than the remaining three<sup>1</sup>.

Styles 1.0–1.3 mm.  $\times$  0.04–0.047 mm. at their widest parts.

Sigmata 0.01–0.11  $\times$  0.0055 mm., with many (10–12 were measured) intermediate sizes, differing in this latter particular from Topsent's description.

Trichodragmata 0.140 mm.

DESMACELLA sp.

Sponge about 15 mm.  $\times$  6 mm.

Probably a young specimen of *D. fortis* Tops.

Styles 1.05  $\times$  0.03; 0.608  $\times$  0.005 mm.

Sigmata 0.016–0.089  $\times$  0.006 mm., with a few intermediates.

Trichodragmata 0.133 mm.

13. CIOCALYPTA MELICHLORA, n. sp. (Plate XIV. fig. 1 and Plate XV. fig. 8.)

The single specimen of this species is broken into about 20 pieces. It must have measured about 20 cm. in breadth and as much in height, and have consisted of a massive basal part breaking up distally into many flattened processes. Fortunately two of these processes have been preserved separately and are in a better condition. They show that the sponge possesses the structure formerly considered to be one of the diagnostic characters of the genus (for Thielé's views see Abh. Senckenb. Ges. xxv. 1900, p. 17); it has a central axis, in which the spicules run longitudinally; from this arise short columns containing spicules placed at right angles to the central axis and supporting the dermal membrane above a spacious subdermal cavity.

Colour in spirit whitish.

Spicules:—

Oxeas in great variety of size and form (Pl. XV. fig. 8), often inequiacinate, the large oxeas very broad in the middle and tapering gradually to fine points. They may be bent once or twice.

<sup>1</sup> See Bateson, 'Materials for the Study of Variation,' p. 433; and Lütken, Ann. & Mag. N. H. 1873, ser. 4, vol. xii. p. 323 (quoted by Bateson).

Oxeas  $0.94 \times 0.04$  to  $0.35 \times 0.03$  mm.; oxeas bent twice,  $0.28 \times 0.06$  mm.

Styles  $0.70 \times 0.34$  mm., occasional.

Still rarer are tornotes  $0.88 \times 0.032$  and  $0.56 \times 0.02$  mm.

Both the stoutest and the slenderest spicules are confined to the axis.

Pulau Bidang.

14. *CIOCALYPTA RUTILA*, n. sp. (Plate XIV. fig. 7.)

Sponge small,  $25 \times 8$  mm.; very fragile, transparent, of a golden-brown colour.

Like that of *C. melichlora* just described, the structure is that typical of the genus in its narrower sense (Ridley & Dendy, Voyage of H.M.S. 'Challenger,' vol. xx. p. 173).

The axial column is of very light build, spongy and cavernous. The dermal membrane like that of *C. hyaloderma* (Ridley & Dendy, loc. cit. p. 174) is marked with little stars where the pillars of supporting spicules meet it.

Oxeas, with a few styles,  $0.98 \times 0.02$  mm.

Pulau Bidang.

15. *TETHYA INGALLI* Bowerb.

*Tethya ingalli* Sollas, Voyage of H.M.S. 'Challenger,' vol. xxv. p. 431, pl. xlv.

Sponge spherical, attached, surface even. Cortex fibrous throughout, about 1 mm. thick, without intercortical cavities. Pores leading into narrow canals. Oscula similar to the pores.

Megascleres: Strongyloxeas  $1.76 \times 0.035$ ;  $1.40 \times 0.03$  mm.;  $0.32$  mm.; slender, abundant.

Microscleres: Spherasters  $0.060$ – $0.012$  mm. Chiasters variable,  $0.012$  mm. Oxyasters  $0.030$ – $0.024$  mm.

Kirkpatrick (P. Z. S. 1900) compares the spicule measurements of Christmas Island, Fremantle, and 'Challenger' specimens thus:—

	Strongyloxea.	Spheraster.	Chiaster.	Oxyaster.
Christmas I. ....	$1.36 \times 0.024$	$0.070$	$0.012$	$0.018$ – $0.024$
Fremantle .....	$1.47 \times 0.035$	$0.070$	$0.012$	$0.036$
'Challenger' .....	$\begin{cases} 1.6\text{--}1.7 \times \\ 0.026\text{--}0.032 \end{cases}$	$0.065$ – $0.085$	$0.012$ – $0.016$	$0.035$ – $0.043$

to which we may add

'Skeat' .....	$\begin{cases} 1.4\text{--}1.76 \times \\ 0.03\text{--}0.035 \end{cases}$	$0.060$ – $0.012$	$0.012$	$0.024$ – $0.030$
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The specimen is gemmiferous, bearing several very young gemmules and one comparatively advanced (8 mm. in diam.), sunk in the parent tissues. In this gemmule microscleres resembling those of the adult are absent, but a number of globules are present—varying in size, the largest being  $0.02$  mm. in diameter. The largest globules are thus a little smaller than the centrum of the largest spheraster of the adult; and I supposed that the globule was the young stage of a spheraster. Since coming to



this conclusion I have seen Maas's paper (SB. Akad. Wiss. München, 1900, pp. 553-569). Maas describes the origin of spherasters from a pair of small calthrops, and I am hence at a loss to account for the globules unless we may suggest that the spherasters have more than one mode of origin.

#### Great Redang.

#### 16. TETHYA MAZA Sel.

*Tethya maza* Selenka, Zeitschr. f. wiss. Zool. xxxii. p. 472, pl. xxviii. (1879); Sollas, Voy. H.M.S. 'Challenger,' vol. xxv. p. 440.

Sponge hemispherical. The curved surface is raised into low, more or less hexagonal bosses. In the depression between the raised areas are the pores leading into extensive, very regularly arranged, intercortical cavities.

The cortex is fibrous only in its inner part. Oscula absent or not distinguishable from the pores. Colour in spirit greyish white. Diameter of circular base 12 mm. The specimen is not gemmiferous.

Megascleres: Strongyloxeas  $1.20 \times 0.025$ ;  $0.8 \times 0.013$  mm.

Microscleres: Spherasters of many sizes, the maximum diameter is  $0.056$ ; centrum  $0.025$  mm.

Chiasters abundant in the dermal membrane and occurring also in the choanosome,  $0.009$ - $0.012$  mm.

Oxyastes  $0.025$ - $0.031$  mm.; actines slender, beset with spines so low as to be mere roughenings. These microscleres often have only 6 rays lying in 3 axes at right angles; in this case one pair of rays is longer than the other two pairs, which are equal to one another.

#### Pulau Bidang.

#### 17. HYMEDESMIA HALLEZI Topsent.

*Hymedesmia hallezi* Topsent, Arch. de Zool. Exp. (3) t. viii. p. 119 (1900).

Sponge growing on a lamellibranch shell together with *Samus anonymus*.

Besides the spicules of the vertical bundles which rest with their oval heads in contact with the surface of support, other more slender tylostyles lie horizontally. The microscleres are distributed uniformly. They are asters of which the slender rays are swollen at the tips. There is a distinct centrum somewhat sharply marked off from the rays. They thus differ to a certain extent from those of the type; but as Topsent mentions that the rays of the spherasters of *H. hallezi* sometimes end in a "*petit bouton non élargi*," this difference is probably unimportant.

Vertical tylostyles  $0.6$ - $0.88 \times 0.01$  mm.

Horizontal tylostyles  $0.50 \times 0.002$ - $0.003$  and  $0.56 \times 0.007$ .

#### Pulau Bidang.

#### 18. SPIRASTRELLA INCONSTANS Dendy. (Plate XIV. fig. 3.)

*Spirastrella inconstans* Thiele, Studien über pacifische Spongien, Zoologica, xxiv. ii. p. 10, pls. 1 & 5.

A single specimen with the note: "a grey sponge from between the stones between tide-marks. Loc. Pulau Bidang, R. Evans."



The identification has been made on the evidence of spicules alone. If it should be correct, the specimen affords yet another example of the extraordinary variety in outward form of this species. The sponge is a simple tube attached below to a small pebble, with the single osculum at its free end. The surface is even.

The skeleton is formed of stout fibres of tylostyles running obliquely to smaller tylostyles projecting vertically to the surface. In the ectosome spirasters are sparsely distributed: they are not present in the interior of the sponge.

Tylostyles of the main skeleton  $0.570 \times 0.025$  to  $0.30 \times 0.01$  mm.

Tylostyles of the ectosome  $0.24 \times 0.01$  mm.

Spirasters: length  $0.02$ – $0.03$  mm.; average number of bends 3; number of spines to each bend 3–5.

Pulau Bidang.

#### 19. SUBERITES LAXOSUBERITES, n. sp. (Plate XV. fig. 4.)

Sponge encrusting, 1–4 mm. in thickness. Oscula not visible. Colour in spirit whitish. Surface even, slightly hispid.

The skeleton consists of short ascending and diverging fibres of styles and of small styles in the ectosome projecting at the surface.

Thus this species combines the fibrous arrangement of the styles of the main skeleton—an arrangement characteristic of *Laxosuberites* Topsent (Arch. de Zool. Exp. sér. 3, t. viii. p. 184)—with the possession of an ectosomal skeleton of small styles like that of *Suberites*. Occasional tylostyles are to be found among the styles of the main skeleton.

Styles  $0.70 \times 0.026$  to  $1.12 \times 0.04$  mm., the breadth measured being the greatest breadth.

Styles of the ectosome  $0.25 \times 0.004$  mm.

Tylostyles  $0.70 \times 0.02$ ; breadth of head  $0.01$  mm.

Pulau Bidang.

#### 20. PSEUDOSUBERITES CAVA, n. sp. (Plate XIV. fig. 6.)

Sponge encrusting, with a few outlying free lobes; transparent; rusty-brown in spirit.

The subdermal cavities are large, and as the sponge forms only a thin crust, they traverse almost its whole thickness; the sponge thus consists of two lamellæ, one attached to the substratum, the other being the dermal membrane, while columns containing bundles of spicules stretch vertically between them.

The spicules in the dermal membrane lie parallel to the surface, those in the columns on reaching the surface spread out and just extend beyond the dermal membrane.

*Spicules*: Styles (not tylote as in the other species of the genus), the largest measuring  $0.54 \times 0.012$  mm.

#### 21. TERPIOS FUGAX Duchassaing & Michelotti.

*Terpios fugax* Keller, Zeitschr. f. wiss. Zool. lii. p. 319; Topsent, Arch. de Zool. Exp. (3) viii. p. 193.

Sponge growing on a lamellibranch shell together with *Amorphina* sp. and *Hymedesmia hallezi*.

## TETRAXONIA.

## CARNOSA.

22. *DERCITUS PLICATUS* Topsent.

*Dercitus plicatus* Topsent, Arch. de Zool. Exp. (3) iii. p. 493 (1895).

Sponge growing on a valve of lamellibranch shell. Pinkish. Surface uneven.

Spicules calthrops-like microtriænes and spined microxeas; **microdichotriænes** absent.

The spicules have a somewhat wider range of size than those of Topsent's specimens.

Orthotriænes, cladus  $0.10-0.24 \times 0.015-0.027$  mm.

Microxeas  $0.012-0.025 \times 0.002-0.003$  mm., including the spines. Great Redang.

23. *DERCITUS PAUPER*, n. sp. (Plate XV. fig. 1.)

Sponge pink, encrusting. The specimen is growing on a piece of dead coral skeleton; it forms a long narrow band about  $50 \times 5$  mm. and 1 or 2 mm. thick. Surface smooth and shining. No oscula visible.

The megascleres are small dichotriænes or simple calthrops-like microtriænes (the latter spicule rare). The megascleres are sparsely distributed, contrasting with the interlocking spicules in *D. plicatus*.

Dichotriæne, protocladus  $0.05-0.06 \times 0.01$ ; deutero-cladus  $0.03$ ; rhabdome  $0.08$  mm.

Orthotriæne, cladus  $0.06-0.07 \times 0.003$  mm.

Spined microxeas  $0.015-0.02 \times 0.001$  mm.

Great Redang.

24. *SAMUS ANONYMA* Gray.

*Samus anonyma* Gray, P.Z.S. 1867, p. 526; Carter, A. M. N. H. ser. 5, vol. iii. p. 350 (1879); Sollas, Voy. of H.M.S. 'Challenger,' vol. xxv. p. 57.

Sponge growing on a lamellibranch shell in company with *Terpios fugax* and *Hymedesmia hallezi*.

The measurements of the spicules agree with those given in the 'Challenger' Monograph.

Pulau Bidang.

## TETRACTINELLIDA.

25. *TETILLA RIDLEYI* Sollas.

*Tetilla ridleyi* Sollas, 'Challenger' Monograph, xxv. p. 48.

Sponge hemispherical; surface rough; oscula few, small, with slightly raised rims, forming an interrupted ring round the sponge. Diameter of base about 16 mm.

Oxeas  $2.16 \times 0.026$  mm.

Protriænes, cladus  $0.037-0.14$  mm.

Anatrienes, cladus 0.015-0.08 mm.

The cladi when as short as 0.015 mm. are also very thick.

Sigmata 0.011 mm.

The skeleton of the walls of the oscular tubes consists of strands of the more slender protrienes and prodrienes, oxeas being absent in these parts.

The ciliated chambers are 0.02 mm. in diameter. In their present state they have very distinct "Sollas' membranes."

Pulau Bidang.

26. *CINACHYRA MALACCENSIS*, n. sp. (Plate XIV. fig. 2 and Plate XV. fig. 5.)

Since the description of the type species, *C. barbatus* Sollas (Voyage of H.M.S. 'Challenger,' vol. xxv. p. 23, pls. iii. & xxxix.), four new species have been added to the genus; v. Lendenfeld when he states (Abh. Senck. Ges. xxi. p. 107, 1897) that his *C. voeltzkowi* from Zanzibar is the only species found since the type, overlooks the three species described by Keller (Zeit. f. wiss. Zool. lii. p. 336, pl. xix., 1891).

The genus as now known contains the following species:—

A. Pores confined to the porocalyces.

a. Porocalyces rough with fine hispidating protrienes.

a. With rooting spicules, with cortical oxeas, with projecting ridges on the surface of the porocalyces ..... *C. barbata* Soll.

b. Without the three characters mentioned as occurring in *C. barbata*. With rhabdodragmas scattered throughout the tissues. *C. eurystoma* Keller.

Red Sea.

β. Porocalyces without hispidating spicules. Microxeas throughout the tissues.

a. Porocalyces with an even surface. Sponge spherical with smooth surface.

*C. schulzei* Keller.

Coast of Aden and Mozambique Channel.

b. Porocalyces with a network of projecting ridges. Sponge conical.

*C. trochiformis* Keller.

Red Sea.

B. Pores not confined to the porocalyces, which latter are without hispidating spicules ..... *C. voeltzkowi* Lendenfeld.

Zanzibar.

The present specimens agree with *C. voeltzkowi* in possessing scattered pores in addition to those of the porocalyces. The surface of the latter structures is raised into a network of fine ridges, but lacks hispidating spicules. The sigmata are smaller than in any hitherto described species.

The sponge approaches a hemispherical form; one specimen having become attached laterally is almost bracket-shaped; in the other the curved surface occupies more than a hemisphere, while the basal membrane is folded and forms a conical surface concave to the exterior.

The porocalyces are either cup-shaped or shell-shaped, in the latter case as much as 3 mm. in diameter.

The cortex is a uniform fibrous collenchyma; canals passing through it from the scattered pores are clearly marked by the abundant sigmata in their walls. The ciliated chambers are small—from 0.015-0.018 mm. in diameter, and composed of only

a few cells, for the most part about 9 cells may be seen on a cross section.

Oxeas  $1.4 \times 0.016$  to  $3.2 \times 0.048$  mm.

Protriænes 2–3 mm. long; cladus 0.03–0.18 mm.

Anatriænes 2.2 mm. long; cladus 0.04–0.08 mm.

Signata 0.008–0.009 mm.

Pulau Bidang off the coast of Kedah.

#### KERATOSA.

##### 27. *EUSPONGIA OFFICINALIS* ? var. *ROTUNDA*.

It is fairly evident that a small piece of sponge separately preserved has been cut off from one of two large specimens, though there is no note to that effect. In this more carefully treated piece the ectosome is preserved, while in the whole sponges very little of it remains and the surface consequently has a honey-combed appearance.

Sponge about 50 mm. high, forming a massive circular wall round a small central hollow.

Oscula numerous, 2–6 mm. in diameter.

Conuli 0.88–1.5 mm. apart and about 0.5 mm. high.

Main fibres 0.04–0.08 mm. thick and on an average .8 mm. apart.

Secondary fibres 0.01–0.03 mm. thick, the most common thickness being 0.02 mm.

Ciliated chambers 0.02–0.03 mm. in diameter.

Aphodal canals 0.015 mm. broad and 0.02–0.03 mm. long.

Colour, in spirit, dark grey externally and pinkish buff within.

Great Redang.

##### 28. *STELOSPONGIA* sp.

A small sponge growing on a piece of dead coral.

Surface very smooth, with sparse low-conuli.

The skeleton is irregular, conspicuously closer-meshed in parts, but it is somewhat difficult to speak of definite fascicles. These smaller meshes measure from 0.3–0.5 mm., while the large ones are about 1.0 mm.

The main fibres measure 0.08–0.12 mm. and have as a rule a dense core of foreign spicules. Occasionally there are large sand-grains at the nodes of the skeleton.

The secondary fibres have a slender axial thread or line of foreign spicules, or sometimes are quite free of spicules.

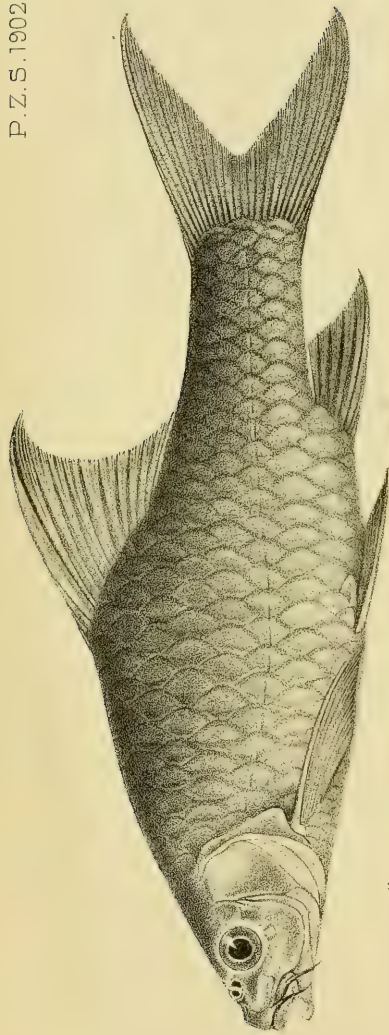
Great Redang.

##### 29. *SPONGELIA DIGITATA*, sp. n. (Plate XIV. fig. 4 and Plate XV. fig. 2.)

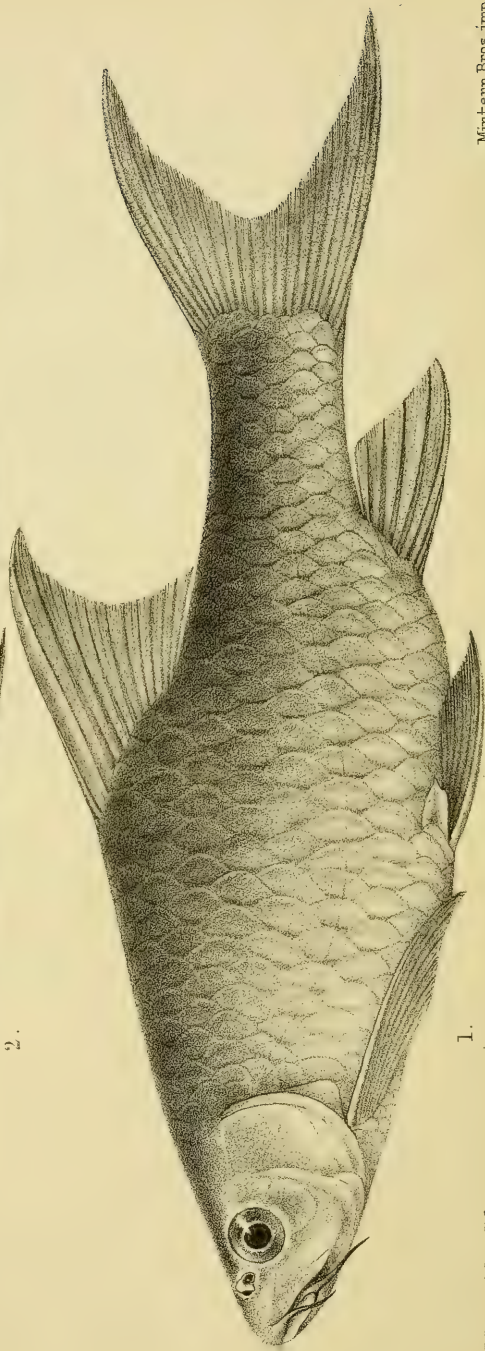
Sponge attached by a thin encrusting base to a rod-shaped piece of dead coral. From this it rises as a long ridge (50 mm. long) which breaks up distally into flattened, bluntly ending processes, measuring  $25 \times 3$ –10 mm.







1.



2.

J. Green. del. et lith.

1. BARBUS HINDII.

2. BARBUS PERPLEXICANS.

Mintern Bros imp.

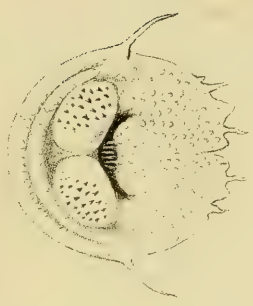




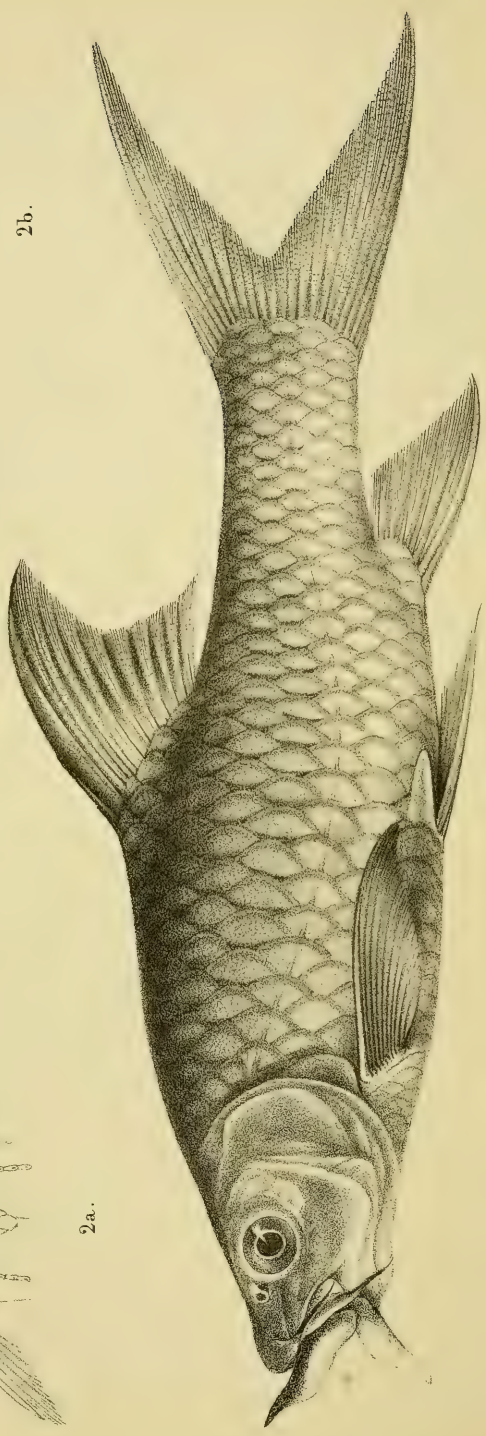
1a.



2.



2b.



1.

J. Green del et lith.

Mutern Bros. imp.

1. BARBUS LABIATUS.

2. CHILOGLANIS BREVIBARBIS.

Surface covered with low conuli 1–2 mm. apart and 0·2–0·4 mm. in height.

Oscula (?) minute, inconspicuous near the tips of the lobes.

The skeleton consists of a network of very thin fibres, which are not distinguishable into main and secondary, and are uniformly areniferous. They form for the most part square meshes about 0·64 mm. in breadth.

Fibres 0·03–0·06 mm. thick.

The ectosome is a thin layer of cystenchyma, thickest at the tips of the lobes. Only in this layer are spongioblasts obvious.

Spermatozoa are present in various stages and in great abundance.

The ciliated chambers measure  $\cdot 07 \times \cdot 04$  mm. on an average.

The whole choanosome is permeated by a filamentous alga (? *Oscillaria spongeliae*).

Great Redang.

#### EXPLANATION OF THE PLATES.

##### PLATE XIV.

- Fig. 1. One of the digitiform processes of *Ciocalypta melichlora*, p. 214. Nat. size.  
 2. *Cinachyra malaccensis* (p. 219), slightly larger than nat. size.  
 3. *Spirastrella inconstans* (p. 216), attached to a fragment of stone. Nat. size.  
 4. *Spongelia digitata* (p. 220), attached to a branch of dead coral. Nat. size.  
 5. *Reniera* sp. 1 (p. 210), growing on a crab.  $\times 2$ .  
 6. A section of *Pseudosuberites cava* (p. 217).  $\times 15$ .  
 7. *Ciocalypta rutila* (p. 215), almost the entire specimen.  $\times \frac{3}{2}$ .  
 8. *Esperella sulevoidea* (p. 213), in section.  $\times 20$ .  
 9. *E. sulevoidea* (p. 213), entire specimen.  $\times \frac{3}{2}$ .

##### PLATE XV.

- Fig. 1. Microcalthrops and spined microxea of *Dercitus pauper*, p. 218.  
 2. One complete mesh of the skeleton of *Spongelia digitata*, p. 220.  
 3. *Reniera* sp. 5 (p. 211). *a*, node of the skeletal network; *b*, egg; *c*, ciliated chamber; *d*, isolated spicule; *e*, piece of fibre with chaplet-cells; *f*, isolated chaplet-cell; *f'*, its segment of fibre.  
 4. Spicules of *Suberites laxosuberites*, p. 217.  
 5. Megasccleres of *Cinachyra malaccensis*, p. 219.  
 6. Sigmata and centrangulate sigmata of *Gellius centrangulatus*, p. 212.  
 7. Sigmata, toxa, and centrangulate sigmata of *Gellius sagittarius*, p. 212.  
 8. Spicules of *Ciocalypta melichlora*, p. 214.  
 9. Spicules of *Biemma democratica*, p. 213.  
 10. Spicules of *Esperella sulevoidea*, p. 213.  
 11. Spicules of *Reniera* sp. 2, p. 210.

#### 8. On the Fishes collected by Mr. S. L. Hinde in the Kenya District, East Africa, with Descriptions of Four new Species. By G. A. BOULENGER, F.R.S.

[Received May 30, 1902.]

(Plates XVI. & XVII.<sup>1</sup>)

The zoological collection recently made by Mr. S. L. Hinde in British East Africa contains a series of Fishes from the Mathoiya River, in the Kenya district, which usefully supplement our

<sup>1</sup> For explanation of the Plates, see p. 224.



knowledge of the fauna of the Tana system, for the first information on which we are indebted to Dr. J. W. Gregory.<sup>1</sup>

A striking feature in the composition of this fauna is the presence of several species of the Cyprinid genus *Barbus*, agreeing in the large scales and the position and structure of the dorsal fin, the last simple ray of which is very large, osseous, and non-serrated, yet differing strikingly in the buccal characters. Two of these species had been described by Dr. Günther as *Barbus tanensis* and *B. intermedius* (Rüppell); three are here added, and although evidently nearly related they would have to be referred to as many genera, viz.: *Barbus*, *Labeobarbus*, and *Capoëta*. *Labeobarbus* has already been relegated to the synonymy of *Barbus* by Günther<sup>2</sup>, and I now feel compelled to do the same with *Capoëta*, with all the more confidence, since new forms recently discovered in Morocco support the same conclusion<sup>3</sup>.

#### CYPRINIDÆ.

1. LABEO FORSKALII Rüpp.
2. LABEO (TYLOGNATHUS) MONTANUS Gthr.
3. BARBUS TANENSIS Gthr.
4. BARBUS HINDII, sp. n. (Plate XVI. fig. 1.)

Depth of body  $2\frac{4}{5}$  to  $3\frac{1}{3}$  times in total length, length of head 4 to  $4\frac{1}{3}$  times. Snout rounded, feebly projecting beyond the mouth,  $1\frac{1}{4}$  to  $1\frac{1}{2}$  times as long as the eye, the diameter of which is 4 to  $4\frac{1}{2}$  times in the length of the head and  $1\frac{1}{3}$  to twice in the interocular width; width of the mouth about half that of the head; lips feebly developed; two pairs of barbels, the first as long as the eye or a little longer, the second a little longer than the first but not more than  $1\frac{1}{2}$  the diameter of the eye. Dorsal IV 9-10, fourth ray very strong, straight, bony, not serrated, as long as the head or longer; the fin is notched and originates above the first rays of the ventral, at equal distance from the end of the snout and the root of the caudal or a little nearer the former. Anal III 5; longest ray  $\frac{3}{4}$  to  $\frac{4}{5}$  the length of the head and narrowly separated from the root of the caudal. Pectoral pointed, nearly as long as the head, not reaching the ventral. Caudal deeply forked. Caudal peduncle  $1\frac{1}{3}$  to  $1\frac{2}{3}$  as long as deep. Scales 25-29  $\frac{4\frac{1}{2}-5\frac{1}{2}}{4\frac{1}{2}}$ , 2 between the lateral line and the root of the ventral. Olive-brown above, silvery below; fins greyish.

Total length 240 millim.

Several specimens.

Distinguished from *B. tanensis* by the shorter barbels.

<sup>1</sup> Cf. Günther, "Report on the Collection of Reptiles and Fishes made by Dr. J. W. Gregory during his Expedition to Mount Kenya," P. Z. S. 1894, pp. 84-91, pls. viii.-xi.

<sup>2</sup> Cat. Fish. vii. p. 84.

<sup>3</sup> Cf. Boulenger, Ann. & Mag. N. H. (7) ix. 1902, p. 124.



5. *BARBUS* (*CAPOËTA*) *PERPLEXICANS*, sp. n. (Plate XVI. fig. 2.)

Depth of body 3 times in total length, length of head 4 times. Snout rounded, slightly concave in front of the nostrils, feebly projecting beyond the mouth,  $1\frac{1}{2}$  as long as the eye, the diameter of which is 4 times in the length of the head and  $1\frac{2}{3}$  in the interocular width; width of mouth about half that of the head; lips feebly developed; lower jaw with a strong, transverse, horny cutting-edge; two pairs of barbels, subequal, and as long as the eye. Dorsal IV 10, fourth ray very strong, straight, bony, not serrated, as long as the head; the fin is notched and originates slightly in advance of the vertical of the first ray of the ventral, a little nearer the end of the snout than the root of the caudal. Anal III 5; longest ray  $\frac{1}{2}$  the length of the head and narrowly separated from the root of the caudal. Pectoral pointed, nearly as long as the head, narrowly separated from the ventral. Caudal deeply forked. Caudal peduncle  $1\frac{1}{2}$  as long as deep. Scales 26–30  $\frac{4\frac{1}{2}}{4\frac{2}{3}}$ , 2 between the lateral line and the root of the ventral. Olive-brown above, silvery below; fins whitish.

Total length 175 millim.

Two specimens.

Although unquestionably referable to the genus *Capoëta* as defined by Günther, this species is so closely related to the preceding that I have felt some hesitation in separating it. However it differs, in addition to having a cutting horny edge on the lower jaw, in the shape of the snout, the shorter posterior barbel, and the origin of the dorsal fin slightly more anterior.

6. *BARBUS* (*LABEOBARBUS*) *LABIATUS*, sp. n. (Plate XVII. fig. 1.)

Depth of body a little greater than length of head,  $3\frac{1}{3}$  times in total length. Snout obtusely pointed, not projecting beyond the mouth, twice as long as the eye, the diameter of which is  $5\frac{1}{2}$  times in the length of the head and twice in the interocular width; width of the mouth about half that of the head; lips extremely developed, each produced into a long triangular flap; two pairs of barbels, the first as long as the eye, the second slightly longer. Dorsal IV 9; fourth ray very strong, curved, bony, not serrated,  $\frac{3}{4}$  the length of the head; the fin is notched and originates above the first rays of the ventral, at equal distance from the nostrils and the root of the caudal. Anal III 5; longest ray  $\frac{2}{3}$  the length of the head and narrowly separated from the root of the caudal. Pectoral pointed, nearly as long as the head, reaching the base of the ventral. Caudal deeply forked. Caudal peduncle  $1\frac{1}{2}$  as long as deep. Scales 28–29  $\frac{4\frac{1}{2}-5\frac{1}{2}}{4\frac{1}{2}}$ , 2 between the lateral line and the root of the ventral. Dark olive-brown above, whitish beneath; fins grey.

Total length 270 millim.

A single specimen.

The larger scales and the longer pectoral fin distinguish this fish from the one referred by Günther to *B. intermedius* of Rüppell,

and which has 8 or 9 branched rays to the dorsal fin and three series of scales between the lateral line and the ventral fin.

The *Barbus* described by Rüppell from Lake Tsana, under the names of *Barbus intermedius*, *B. affinis*, *B. elongatus*, and *Labeobarbus nedgia*, the type-specimens of which have been kindly entrusted to me by the Directors of the Senckenberg Museum, agree with the Tana species in the large scales and the very strong fourth dorsal ray. All have 8 branched rays in the dorsal fin and 3 series of scales between the lateral line and the ventral fin.

#### SILURIDÆ.

##### 7. CHILOGLANIS BREVIBARBIS, sp. n. (Plate XVII. fig. 2.)

Body slightly depressed, its depth 6 times in total length. Head strongly depressed,  $1\frac{1}{3}$  as long as broad, its length 3 times in total length. Eye directed upwards, in the second half of the head, its diameter  $5\frac{1}{2}$  times in length of head and  $1\frac{1}{3}$  in interorbital width; anterior nostril equally distinct from the end of the snout and the eye, posterior separated from the eye by a space equal to the diameter of the latter; premaxillary teeth wide apart, in two large oval groups, forming 4 or 5 transverse series; 6 rather strong mandibular teeth; maxillary barbel scarcely longer than the eye, lower labials shorter than the eye. Dorsal I 5; spine not serrated, half the length of the head. Adipose fin half as long as its distance from the rayed dorsal. Anal III 7. Pectoral spine  $\frac{2}{3}$  the length of the head. Ventral extending to the origin of the anal. Caudal forked. Caudal peduncle nearly twice as long as deep. Pale brownish above, with four irregular dark cross-bands connected by a dark lateral stripe, whitish beneath; two dark bars across the anal; a dark bar at the base of the caudal, another across each lobe of the fin, and a dark streak along the lower lobe.

Total length 55 millim.

A single specimen.

This species differs from *C. deckeni* Ptrs. and *C. niloticus* Blgr. in the shorter barbels and the stronger mandibular teeth.

#### ANGUILLIDÆ.

##### 8. ANGUILLA BENGALENSIS Gray.

*Anguilla labiata* Ptrs. is not separable from this species.

#### EXPLANATION OF THE PLATES.

##### PLATE XVI.

Fig. 1. *Barbus hindii*, p. 222, reduced  $\frac{2}{3}$ .

2. „ *perplexicans*, p. 223, reduced  $\frac{2}{3}$ .

##### PLATE XVII.

Fig. 1. *Barbus labiatus*, p. 223, reduced  $\frac{1}{4}$ .

2. *Chiloglanis brevibarbis*, p. 224, nat. size.

2 a. „ „ upper view of head,  $\times 2$ .

2 b. „ „ mouth,  $\times 3$ .





November 4, 1902.

G. A. BOULENGER, Esq., F.R.S., Vice-President,  
in the Chair.

The Secretary read the following reports on the additions made to the Society's Menagerie during the months of June, July, August, and September, 1902 :—

The number of registered additions to the Society's Menagerie during the month of June was 286, of which 44 were by presentation, 13 by birth, 10 by purchase, and 217 were received on deposit and 2 in exchange. The number of departures during the same period, by death and removals, was 156.

Amongst these special attention may be drawn to :—

1. A young male Brindled Gnu (*Connochaetes taurinus*), born in the Gardens on June 10th, being the second specimen of this Antelope bred by the Society (see P. Z. S. 1900, p. 771, pl. xlviii.).

2. A Sepoy Finch (*Hæmatospiza sipahi*) from India, received in exchange June 10th, being of a species new to the Society's Collection.

3. A male Great Bird of Paradise (*Paradisæa apoda*), received in exchange from the Zoological Gardens, Calcutta, on June 15th. This bird, lodged at present in the Insect-house, is doing well, and having moulted, is now acquiring its fresh dress.

4. A young male Proboscis Monkey (*Nasalis larvatus*), obtained by purchase on June 30th, being the first specimen of this remarkable Monkey ever received alive by the Society. A water-colour drawing of it, prepared by Mr. J. Smit (Pl. XVIII.), is exhibited. The animal unfortunately died quite suddenly on September 6th.

The number of registered additions to the Society's Menagerie during the month of July was 292, of which 68 were acquired by presentation, 19 by birth, 18 by purchase, and 187 were received on deposit. The number of departures during the same period, by death and removals, was 207.

Among these special attention may be drawn to :—

1. A young female of the Racket-tailed Parrot of Celebes (*Prioniturus platurus*), purchased July 4th, new to the Collection.

2. A pair of young Giraffes (*Giraffa camelopardalis*), from Kordofan, presented by Col. B. Mahon, C.B., D.S.O., as already announced to the Society (see P. Z. S. 1901, vol. ii. p. 471), which had arrived on July 19th in excellent condition.

3. Two female Grévy's Zebras (*Equus grevyi*), from Southern Abyssinia. These animals were presented to H.M. The King by the Emperor Menelek, and were placed under the Society's care by His Majesty's orders on July 12th.

4. A fine young hybrid, believed to have been bred between a stallion Pony and a female Burchell's Zebra (*Equus burchelli*) in the Transvaal Colony, presented by His Majesty The King on July 19th.



The registered additions to the Society's Menagerie during the month of August were 141 in number. Of these 62 were acquired by presentation, 2 by purchase, 8 were born in the Gardens, and 64 were received on deposit and 5 in exchange. The number of departures during the same period, by death and removals, was 160.

The number of registered additions to the Society's Menagerie during the month of September was 125, of which 67 were by presentation, 1 by purchase, 6 were born in the Gardens, and 51 were received on deposit. The number of departures during the same period, by death and removals, was 138.

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Mr. Sclater exhibited a photograph of a Persian Ibex (text-fig. 55), obtained in the hills not far from Shiraz (and probably

Text-fig. 55.



Persian Ibex. (Taken from a photograph.)

referable to *Capra aegagrus*), which had been sent to him by Mr. B. T. Finch. It was said to have been taken on board the s.s. 'Scharlachberger' in Karachee Harbour, and was the individual referred to by Mr. J. Strip in his letter to 'The Field' of Aug. 6th, 1898 (vol. xcii. p. 274). The length of the left horn was said to be no less than  $55\frac{1}{2}$  inches, and the right, which was slightly broken,  $50\frac{1}{2}$  inches.

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Mr. Sclater exhibited some photographs of the Rocky Mountain Goats in the Gardens of the Zoological Society of Philadelphia, and read the following extracts from Mr. A. E. Brown's letter concerning them:—

"When I saw you in April, you expressed a desire to have a photograph of our Rocky Mountain Goat (*Haplocerus montanus*). I now send you one, taken a few days ago by Mr. Carson of this Society.

"The male was born about May 15th, 1901, in the Canadian Rocky Mountains, near Field, British Columbia, on the Canadian Pacific Railway. The mother was killed on May 29th by a Swiss guide, who captured the kid, raised it by hand, and brought it to the Gardens October 1st. At that time it was 2 feet in height at the shoulder, and weighed 55 lbs. Its horns were  $1\frac{1}{2}$  inches long on the anterior face. It now weighs 96 lbs., height 30 inches, length of horns  $6\frac{1}{4}$  inches, circumference at base 4 inches.

"The female was presented to the Society on Dec. 22, 1901. It came from Central Idaho and was evidently bred in the previous year, but I was not able to secure any exact information about it. It is now 28 inches in height; weight 74 pounds; length of horns  $7\frac{3}{4}$  inches, which are more slender than in the male. Both these animals have remained in uniformly good health, but have not yet had to encounter a long period of great heat, the effects of which I fear; but on Saturday last the thermometer rose to 93° Fahr., from which they did not seem to suffer distress."

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Dr. Günther exhibited living tadpoles of the North-American Bull-frog (*Rana mugiens*) bred in Surrey. They were the offspring of specimens introduced by the Hon. Charles Ellis, F.Z.S. Although a great number of these tadpoles had been reared this year in the ponds near Mr. Ellis's residence, the majority attaining to their full size, none of them had been observed to complete their metamorphosis. They were therefore obliged to hibernate, like many of the tadpoles of *Rana esculenta* var. *ridibunda*, which have been acclimatized in the same locality.

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Sir Henry H. Howorth, K.C.I.E., F.R.S., exhibited and made remarks upon the head of a Virginian Deer (*Cariacus virginianus*) shot by an experienced old hunter in the mountains of New

Mexico. It was interesting from the fact that its horns instead of having grown naturally had become crumpled into a mass of spongy matter still covered with the velvet, and exhibited the morbid growths into which the horns of deer often develop when the animal's genitals are injured. In such cases, not only does the deer cease to shed its horns annually, but they often cease to bear horns at all. Sir Henry suggested that some experiments might be made to try and discover a little more closely the physiological cause of the aborted horns; this might perhaps throw some light on the apparently anomalous fact that in the various races of Reindeer both sexes have horns.

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Mr. R. E. Holding exhibited and made remarks upon the lower jaw of a Highland Ram in which the last molar tooth was reduplicated on both sides, and called attention to a curious outward deflection of the coronoid process and its projection beyond the condyle, and the consequent alteration of the sigmoid curve and adjacent parts, the last molar being also pushed out of its normal position by the persistent growth of the reduplicated tooth. Mr. Holding was under the impression that these variations in the form of the jaw were attributable to alterations in its movement to accommodate the supplementary molars.

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The following extract from a letter addressed to the Secretary by the Rev. Francis C. R. Jourdain, of Clifton Vicarage, Ashbourne, Derbyshire, was read:—

"In the P. Z. S. for 1901 (vol. ii. p. 216) there appeared an article by Mr. J. G. Millais, F.Z.S., on the (supposed) second occurrence of Bechstein's Bat in England.

"This, of course, was an error, as two specimens of this Bat were taken by my friend Mr. E. W. H. Blagg, of Cheadle, Staffordshire, in the New Forest in 1886, and identified at the British Museum (see 'Zoologist,' 1888, p. 260). How Mr. Lydekker came to overlook this in writing his 'Handbook of British Mammals' I cannot understand, as Mr. Blagg's specimens passed through the hands of Mr. Oldfield Thomas. I wrote at the time to Mr. Millais, who expressed his intention of making the correction. As he has not done so, I beg to be allowed to point it out."

---

Dr. C. W. Andrews, F.Z.S., exhibited specimens and lantern-slides illustrating a collection of fossil vertebrates obtained from the Fayum district of Upper Egypt during the last winter.

The most interesting of the new forms here brought to light was *Arsinoitherium zitteli*, an extraordinary Ungulate discovered by Mr. H. J. L. Beadnell last year. This animal was chiefly remarkable for the enormous bifid bony horn borne on the nasal region; there was also a pair of small conical horns over the

orbits. The teeth were of a very remarkable type; each of the molars consisting of two transverse ridges united internally with the continuous inner wall of the tooth, so that the molar as a whole somewhat resembled a reversed molar of a Rhinoceros. The dental formula seemed to have been I. 1, Pm. 3, M. 3, in both upper and lower jaws. The affinities of this animal were quite uncertain, but the limb-bones which seemed to belong to it indicated relationship with the Proboscidea, of which it may have been an early but highly specialized offshoot.

Another peculiar mammal was *Phiomia serridens*, of which the anterior part of the mandible was the type. In this animal there was a single pair of very large procumbent incisors with a peculiarly serrated outer edge; behind this there was a long edentulous diastema, much as in the Rodents, then came a small premolar and a large molar similar to the carnassial of some of the Carnivora. The relationships of this creature were likewise quite uncertain: it had been suggested that it might be a peculiarly modified Creodont, but it possessed some characters that seemed to point to the Diprotodont Marsupials, and even to the Multituberculata. Further material would be necessary before the question could be settled. An early member of the Hyracoidea and a gigantic land-tortoise allied to *Testudo perpiniana*, also found by Mr. Beadnell, were likewise referred to.

The further remains of *Mærittherium* and *Palæomastodon* collected fully confirmed the position ascribed to these genera as early forms of the Proboscidea. Of *Palæomastodon* the upper and lower dentitions were now fully known, with the exception of the front teeth of the upper jaw. The dental formula for the cheek-teeth was:—Pm.  $\frac{3}{2}$ , M.  $\frac{3}{3}$ . The single lower pair of incisors were procumbent and in contact in the middle line; anteriorly they wore to a sharp edge. The upper incisors seemed to have been compressed, downwardly-directed tusks, with enamel on one face only. In the skull the jugal bone was large and extended on to the face, not being merely a small bar of bone in the middle of the zygomatic arch as in the Elephantidæ.

Dr. Andrews pointed out the great differences between the Middle Eocene *Mærittherium* and the Upper Eocene *Palæomastodon*, and suggested that the more rapid rate at which evolution seemed to have proceeded in the earlier stages of development of many groups of mammals might perhaps in some cases be accounted for as follows:—

“Among the Ungulates, at least, the earlier members of a group “are usually of small size, and as specialization advances an “increase in bulk also takes place; a well-marked instance of this “may be seen in the line of descent of the Horse, and there are “many other cases. This increase in bulk must, in most cases, “involve a lengthening of the individual life, which is often “indicated in the gradually increasing hypselodonty of the teeth, “implying an increased period of efficiency. When the length



“of the individual life becomes greater, a proportionately smaller  
“number of generations will succeed one another in a given time,  
“and therefore the rate of change that the stock will undergo will  
“be lowered. The same cause may have brought about the ex-  
“tinction of many of the bulky, highly specialized, and presumably  
“slow-breeding groups of animals, such as the Titanotheres, which  
“have been unable to undergo sufficiently rapid modification  
“to enable them to keep in harmony with a changing en-  
“vironment.”

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The following papers were read:—

1. Observations on some Mimetic Insects and Spiders from Borneo and Singapore. By R. SHELFORD, M.A., C.M.Z.S., Curator of the Sarawak Museum. With Appendices containing Descriptions of new Species by R. SHELFORD, Dr. KARL JORDAN, C. J. GAHAN, the Rev. H. S. GORHAM, and Dr. A. SENNA.

[Received November 13, 1901.]

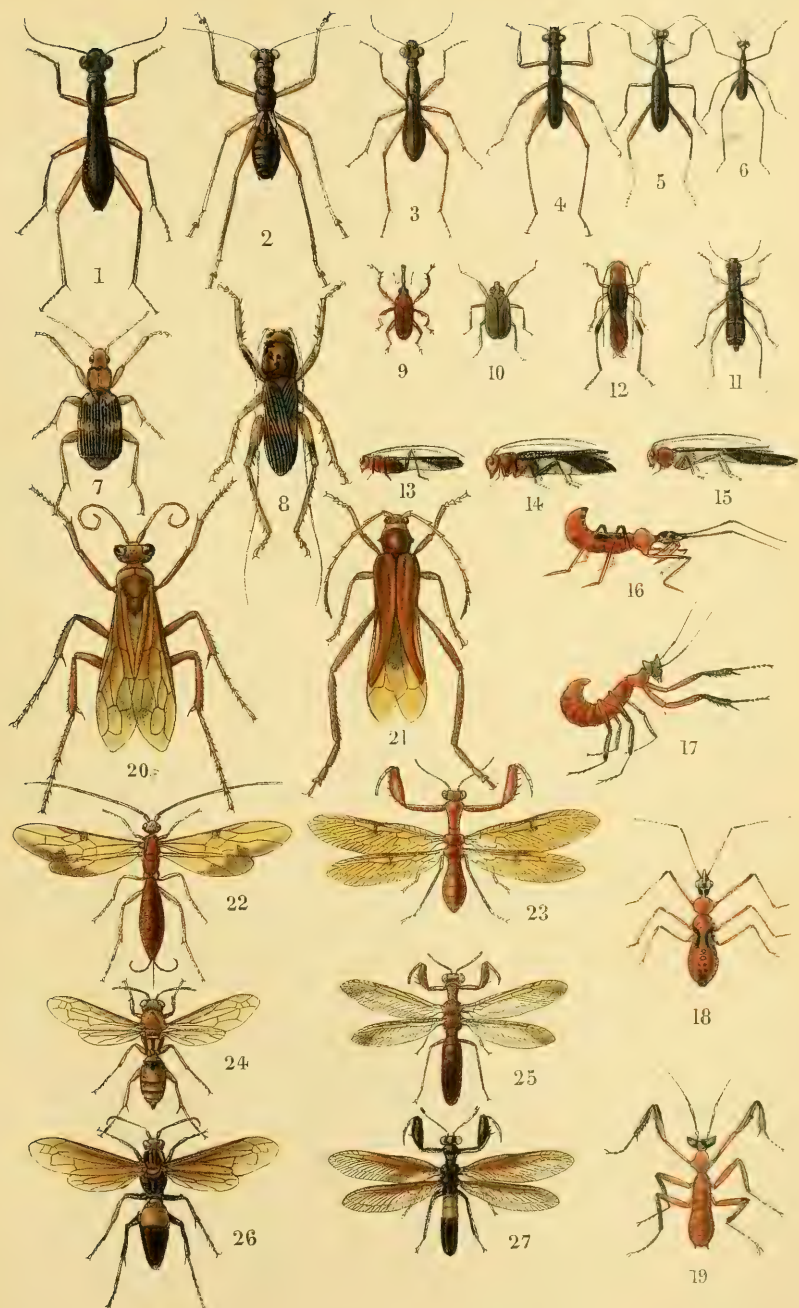
(Plates XIX.–XXIII.<sup>1</sup>)

The theory of mimicry having originated and having been further elaborated chiefly from a study of South American insects, it is but natural that these should figure largely in all works relating to the subject. This paper, a brief abstract of which, arranged by Professor Poulton, appeared in the British Association Reports, 1900, p. 795, is an attempt to bring into greater notice the richness of the Malayan sub-region in similar mimetic species—nearly all the examples here described and discussed having been captured within the last four years in a circumscribed area of 10 mile radius, with Kuching, the capital of Sarawak, as its centre. A recent collecting-trip of three weeks' duration to Mt. Penrissen (about 50 miles inland) was productive of several new examples; and I feel convinced that a similar reward awaits the collector on other mountains of the island and on those of Sumatra, Celebes, and other numerous islands of the great Archipelago, many of which are still virgin ground to the entomologist.

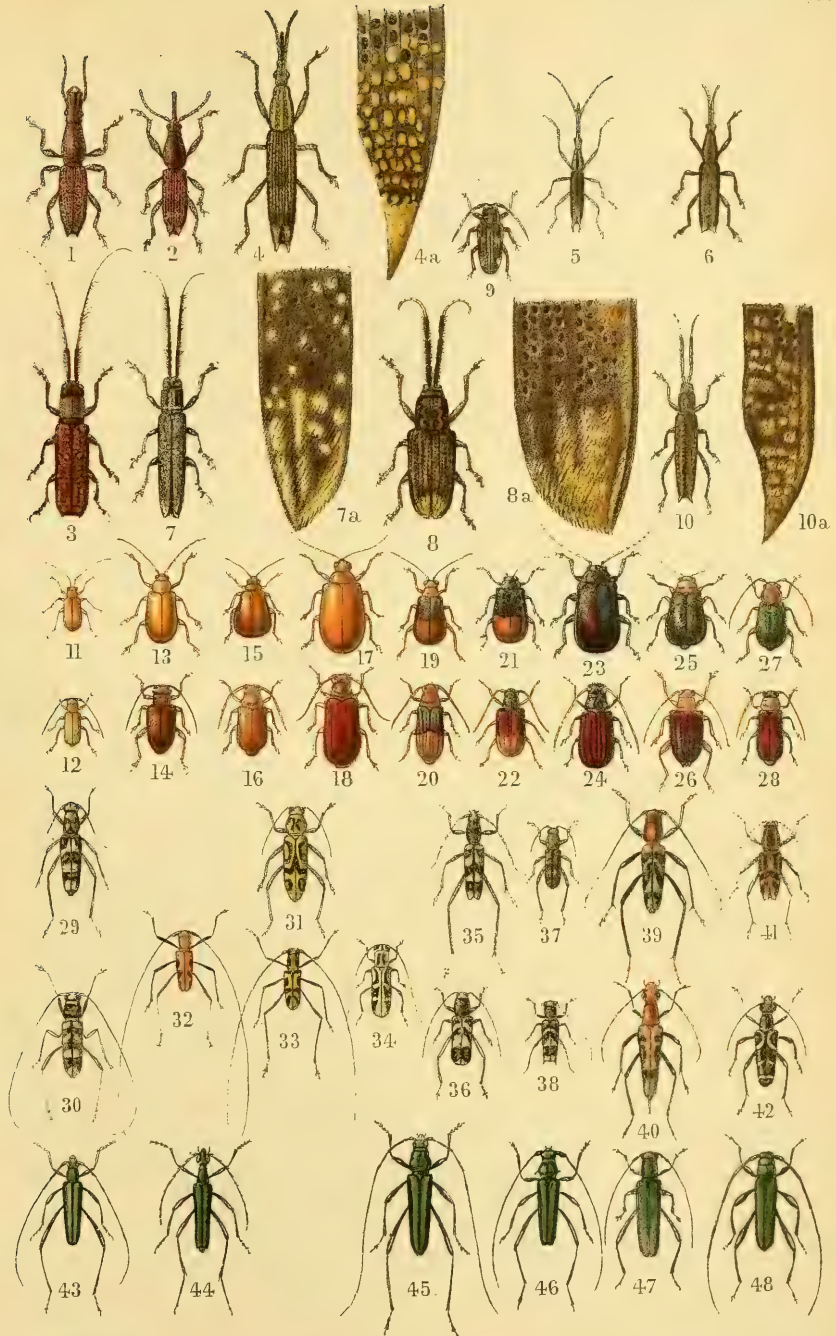
In order to summarize as much as possible our knowledge of the mimetic insects of Borneo, I have drawn up tables of the mimetic Longicorn Beetles and of the Lepidoptera; the latter is a modification of a somewhat similar list given by Haase in his 'Researches on Mimicry' (English translation), Stuttgart, 1896, but I have found it necessary to question certain conclusions and to make a few additions.

<sup>1</sup> For explanation of the Plates, see page 231.

















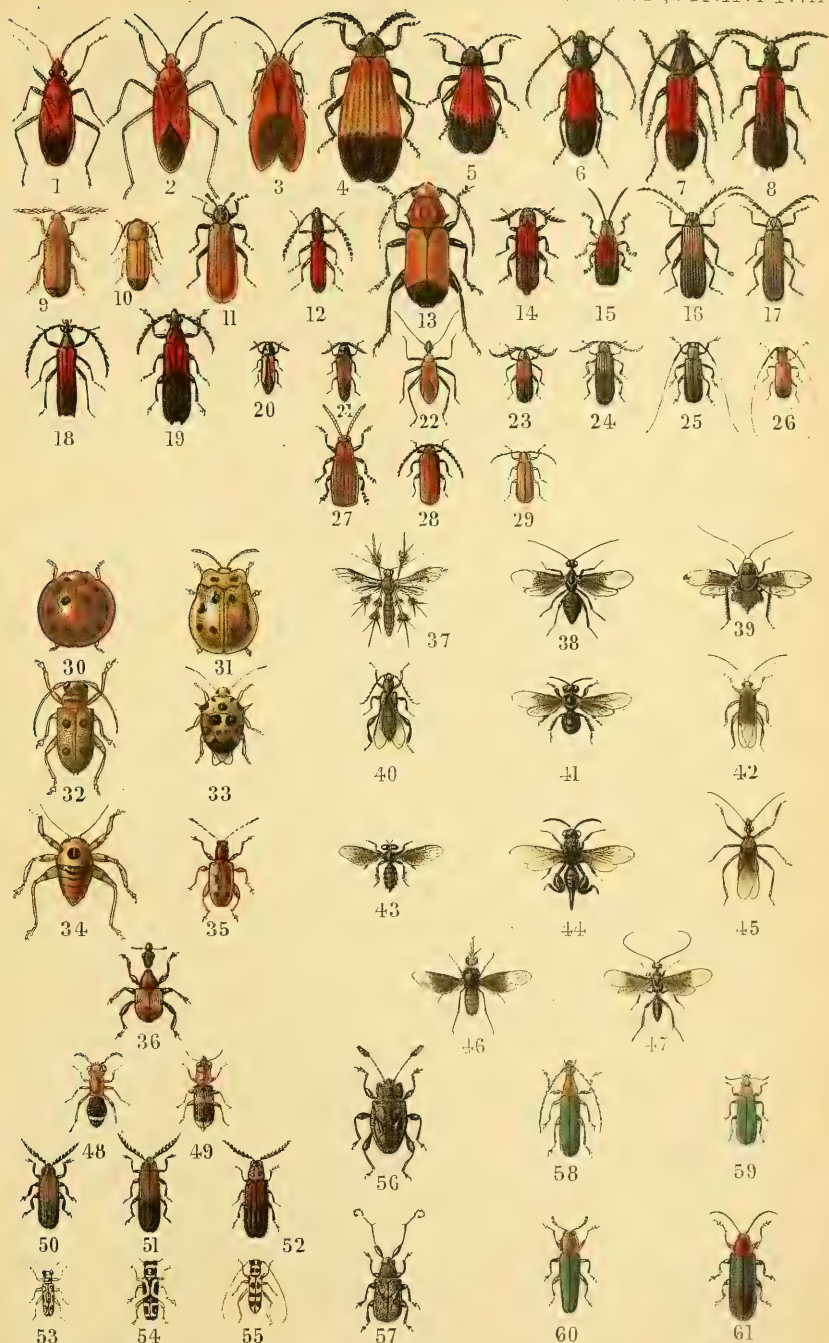












Horace Knight del et lith.

Mintern Bros. Chromo.

MULLERIAN MIMICRY IN GROUPS OF BORNEAN INSECTS.



It is frequently possible to pair a mimicking species with a definite specific model, but perhaps more frequently the mimic (either a Batesian or a Müllerian mimic) in its general appearance resembles a whole group of known distasteful insects; or, in other words, the general appearance of the mimic is typical of a distasteful group, rather than exactly similar to one definite species; and in these tables of mimetic Longicorns and their models I have by no means included all, but merely typical models.

The diagrammatic tables of convergent groups of pseud-aposematic and synaposematic insects at the end of the paper include, however, all the known distasteful insects which serve as models in the respective groups.

In the Appendices are described a new species of Butterfly, a new Moth, two new genera and several species of Longicorn Beetles, two new Clerids, and two new Brentheids. I owe the description of all except the first-mentioned species to the kindness of Dr. Karl Jordan, Mr. C. J. Gahan, the Rev. H. S. Gorham, and Dr. A. Senna.

Professor E. B. Poulton, F.R.S., has added some interesting and suggestive remarks on my observations: these are scattered throughout the paper, but in all cases his initials are affixed.

My task, in the absence of a large library and of named collections for comparison and reference, has not been easy, but I have received the most valuable and generous aid from Professor Poulton, whom I feel that I can never sufficiently thank. It is not too much to say that had it not been for his help this paper could not have been written. Most of the specimens here described and figured are now deposited in the Hope Museum, Oxford, where they can be seen by all students of the subject. I am much indebted to Mr. H. N. Ridley, Director of the Botanic Gardens, Singapore, for directing my attention to some interesting cases of mimicry observed by him and for some valuable notes thereon. Mr. Gilbert J. Arrow, Monsieur Jules Bourgeois, Mr. Malcolm Burr, Sir G. Hampson, Dr. F. A. Dixey, Dr. R. Gestro, the Rev. O. Pickard-Cambridge, F.R.S., Mr. R. McLachlan, F.R.S., Mr. W. L. Distant, Mr. C. J. Gahan, Dr. Senna, Mr. M. Jacoby, Col. Bingham, Mr. E. E. Austen, Mr. C. O. Waterhouse, Dr. Brunner von Wattenwyl, and Col. Yerbury have rendered much kind assistance in identifying many of the species noted in this paper, and to these gentlemen I tender my grateful thanks.

## I. ORTHOPTERA AS MIMICS.

- i. Mimic. Larva of *Hymenopus bicornis* (Stoll).

Plate XIX. figs. 17 & 19.  $\times 2$ .

**Model.** Larva of *Eulyes amœna* (Fab.).

Plate XIX. figs. 16 & 18.  $\times 2$ .

The newly-hatched larvæ of *Hymenopus bicornis*, one of the

Harpagid Mantidæ, mimic the young larvæ of the Reduviid bug, *Eulyes amœna*, not only in coloration, but also in the peculiar habit of walking about with the abdomen curled over the back (compare figs. 16 & 17). When the young Mantides first emerge from the ootheca they are of a brilliant red colour, the head, basal joint of the antennæ, apices of the femora, and the tibiæ alone being jet-black. A similar arrangement of colours is exhibited by the young of *E. amœna*: in these the head, apices of the femora, bases of the tibiæ, the wing-rudiments, and some spots on the dorsal surface of the abdomen are black, whilst all the rest is vermilion (compare figs. 18 & 19). The newly-hatched larvæ of the bug are very much smaller than the corresponding stage of the Mantis, but after the second moult the size of the former is almost the same as that of their mimics when newly-hatched. The brilliant coloration of the bug is essentially a warning signal, being correlated with an objectionable smell and presumably a still more objectionable taste, judging from the expressions of disgust manifested by two tame monkeys (*Macacus cynomolgus*) after tasting the specimens I offered them. The young *Hymenopus* they had eaten with the utmost sangfroid a few days before, from which one may justly conclude that in this case the coloration is deceptively warning or pseudaposematic (truly mimetic). It is unfortunate that I was unable to rear, or even to keep alive for a few days longer, the young Mantides; but they are notoriously difficult insects to rear, and all my specimens died before I was able to obtain the young of *Eulyes amœna*. The pupa and adult of this species of Mantis are floral simulators: the former resembles a pink *Melastoma*; the latter, which is cream-coloured varied with brown, resembles the flower of an orchid of fairly common occurrence; and I have also seen a young larva which bore a striking resemblance to a small pink flower of an order not known to me. I have had this insect in various stages of its life-history frequently under observation, and can confirm in almost every detail Mr. Annandale's recently published account of the habits of the pupa (*cf.* P. Z. S. 1900, pp. 839 *et seq.*). That the insect should mimic in the youngest stage of its life-history a distasteful and conspicuously-coloured bug is a fact of some interest.

[The late Mr. L. de Nicéville states, in a letter to Prof. Poulton, that he had reared some species of Mantidæ; one species when newly hatched was remarkably like a small black ant, the deceptive resemblance being so close that a careful scrutiny was necessary to determine the exact nature of the insect. Mr. de Nicéville also remarks:—"A Mantis of fair size does not often move but waits for its prey to come to it, but these young ones ran about incessantly looking for their prey, just like the ants they mimicked."]

ii. **Mimic.** *Condylodera tricondyloides* (Westw.).

Plate XIX. figs. 2, 4, &amp; 6.

**Models.** *Cicindelidæ*. Plate XIX. figs. 1, 3, & 5.

I was fortunate enough to discover in Sarawak the remarkable Locustid, *Condylodera tricondyloides*, originally described in 1837 by Westwood from Java (Trans. Linn. Soc. vol. xviii. p. 409); the type specimen was at first placed by Westwood in his collection of Cicindelidæ, "regarding it as an immature *Collururus* or *Tricondyla*" (l. c. p. 419). Another Javan specimen was actually given the MS. name of *Tricondyla rufipes* by Duponchel, so close is the resemblance of this highly deceptive Locustid to a Tiger-beetle. Both these historical specimens are now in the Hope Collection at Oxford, and have been compared with the Sarawak specimens by Mr. Malcolm Burr.

My first specimen, which is somewhat larger than the type, was found in jungle in the neighbourhood of Kuching, running about on the ground amongst dead leaves and other vegetable debris, an environment much frequented by a large Tiger-beetle, *Tricondyla cyanea* (Dej.) var. *wallacei* (Thoms.), with which this Locustid is almost identical in appearance (compare Plate XIX. figs. 1 & 2). The shape, size, coloration, and even the gait of the mimic so closely resembled the corresponding traits of its model, that I did not suspect the importance of my find till a careful examination of the collecting-box had been made some hours after the time of capture. The colour of the head, thorax, and abdomen of the *Condylodera* is a dark shining blue, the femora of all the legs are red, the hind femora (which are only slightly swollen) having in addition a proximal black band. The head with its large prominent eyes, somewhat flattened face, and conspicuous jaws, is very Cicindelid in appearance. The antennæ are of extreme tenuity and are about  $2\frac{1}{2}$  to 3 times as long as the body. The densely-punctured prothorax is globosely swollen about its middle, the swelling being marked off from the elevated anterior border and posterior portion by broad constrictions. The tegminal and wing rudiments lie very closely adpressed to the body and do not disturb the even contour of the dorsal aspect. The abdomen, though hardly so bottle-shaped as are the elytra and abdomen of the model, is not widely different in appearance, and the intersegmental membranes are quite concealed except on the ventral surface, where the scuta are small, as is usual in this group of insects.

The model is so common and so well known a species that it is unnecessary to describe its general appearance; the above brief description of its mimic will suffice to show in how many superficial points the two insects agree, and superficiality of resemblance is the key-note of mimicry.

Another specimen of this mimetic Locustid of the same size was obtained a few months later in the same locality; and both these



are pronounced to be fully adult by that well-known authority on the Orthoptera, Mr. Malcolm Burr.

Bearing in mind the errors made by Westwood and Duponchel with regard to this insect, I made a careful search through the Sarawak Museum collection of Cicindelidæ, and was rewarded by finding yet another example of this remarkable mimic placed amongst specimens of *Tricondyla gibba* (Chaud.), which it most closely resembles as regards size, coloration, &c. The specimen was smaller than those described above and is evidently a younger stage, but it differs in hardly any other way; and *T. gibba*, the model, also differs from *T. cyanea* var. *wallacei* principally in size (compare Plate XIX. figs. 3 & 4).

A fourth specimen, of a very early stage, was taken in Kuching on the flowers of a flowering tree, frequented also by numerous insects of all orders, amongst others being the Cicinelid, *Collyris sarawakensis* (Thoms.), which serves as a model to the young *Condylodera* (Plate XIX. figs. 5 & 6). At this stage, the insect is entirely dark blue, except the legs which are dark brown, and the greater part of the long antennæ which are ochreous, the four basal joints only being blue. The prothorax shows no trace of the conspicuous puncturation of the adult, nor is it swollen as in the later stages, but more or less cylindrical like that of its model; the wing-rudiments are not yet visible, and the auditory organ on the fore-tibiæ can only be distinguished with difficulty. The model is somewhat larger, of a uniform dark blue with the legs dark brown. It is somewhat curious that the young *Condylodera* does not mimic *Collyris emarginata* (Mael.), a smaller species with red legs, especially since in the later stages it is red-legged species of Cicindelidæ that are mimicked; *C. emarginata* is, however, of a much more brilliant blue than any other Bornean members of the genus, or than the species of *Tricondyla*. This case of mimicry appears to me to be of exceptional interest and without a parallel. I have shown that *Hymenopus bicornis*, a floral simulator throughout the greater part of its life, mimics in its young stages the larvæ of a bug; but I know of no ametabolous insect, except *Condylodera tricondyloides*, which mimics different species of one family during the successive periods of its growth.

iii. **Mimic.** *Gryllacris* n. sp. vicinissima *nigratæ* (Br.).

Plate XIX. fig. 8.

**Model.** *Pheropsophus agnatus* (Chaud.). Plate XIX. fig. 7.

The model in this instance is one of the "Bombardier Beetles," and discharges, when seized or irritated, a jet of formic acid vapour quite powerful enough to scorch the skin of the finger severely and to leave an indelible brown stain on paper or cloth. The insect is quite conspicuous, being black with orange spots on the dorsal surface of the thorax and tegmina; the legs and antennæ are entirely orange. The Locustid is somewhat larger,

and though the markings do not correspond accurately with those of the model, a general resemblance is produced. The head is orange, the prothorax is black with large orange blotches, the tegmina are black with an orange spot at the base of each, corresponding to a similar spot at the base of each elytron of the beetle, and with an orange fascia about the middle, corresponding to a broad orange spot in a similar position on each elytron of the beetle. The legs are banded with orange and black (compare Plate XIX. figs. 7 & 8). The mimic is met with amongst herbage in jungle, and all the examples of the somewhat common "Bombardier" that I have met with were taken in the same environment. The powerful jaws of the larger *Gryllacrides* furnish possibly an efficient protection against the attacks of vertebrate enemies, such as small birds, lizards, and frogs, but in so small a species as this the resemblance to a beetle capable of discharging a scorching jet of formic acid vapour must be a far more efficient means of protection.

iv. **Mimic.** Nov. gen., nov. sp. vicinissima *Gammarelettigi*.  
Plate XXIII. fig. 34.

**Model.** *Coccinellidæ*. Plate XXIII. fig. 30.

In February 1901 the Museum collectors brought in a small Locustid of a brilliant vermilion colour spotted with black. When the insect was resting the head was bent downwards and almost concealed by the large prothoracic shield, the abdomen was strongly curved downwards and the legs were drawn close up to the body, the long hind tibiae being bent up under their femora: in this attitude the resemblance of the insect to a black-spotted red "ladybird" of a convex shape, e. g. *Caria dilatata* (Fab.), was most striking (compare Plate XXIII. figs. 30 & 34). The eyes are intense black; the large prothoracic shield has three black spots, one central, the others lateral; the segments of the abdomen bear each a small dorsal black spot, decreasing in size posteriorly; the fore- and mid-femora bear outwardly one conspicuous spot, whilst the hind-femora have two such spots.

When touched, this little Locustid did not leap away, as might have been expected, but kept perfectly still, and if further irritated it simply rolled off the surface on which it was resting and assumed a death-like attitude on the ground below, thus simulating very perfectly the habits of a Coccinellid.

I have to thank the distinguished orthopterist Brunner v. Wattenwyl for reporting on this Locustid and the *Gryllacris*.

## II. NEUROPTERA AS MIMICS.

i. **Mimic.** *Mantispa simulatrix* (McLachl.). Plate XIX. fig. 23.

**Model.** *Bracon* sp. Plate XIX. fig. 22.

This case offers an instance of the distastefulness of the Hymenoptera Parasitica, a group mimicked also by insects

belonging to the most diverse orders, such as Hemiptera, Diptera, Lepidoptera, and Coleoptera.

The model is one of those reddish-ochraceous Braconids, of which there are many representatives in Borneo, all being more or less common. This particular species, with a conspicuous black stigma on the fore wing, is eminently a mountain form, as the numerous specimens in the Sarawak Museum bear witness. Mt. Matang at any elevation above 1500 feet is its favourite haunt, but I have never taken it below that altitude. The mimic, which was recently described<sup>1</sup> by Mr. McLachlan, was captured in the month of August also on Mt. Matang, at an altitude of 2500–2800 feet. It, too, is reddish-ochraceous, whilst each wing bears a black stigma, those on the fore-wings being slightly more conspicuous than those on the hind-wings; the sides and ventral surface of the abdomen are pure white (in the fresh condition), so that when the insect is seen in profile its somewhat bulky body appears to be reduced approximately to the size of the body of its model; as, further, the model also has the ventral surface of the abdomen coloured white, the resemblance between the two insects is still greater (compare Plate XIX. figs. 22 & 23). This method of producing a thin-bodied or wasp-waisted effect by white patches is by no means uncommon amongst insects; I shall be able to give further examples of it in this paper (*vide infra*, pp. 238, 241), and at present need only refer to the well-known Soudanese Locustid *Myrmecophana fallax* (Br.) mimicking an ant, and to the Moth *Pseudosphex hyalina* which mimics a Sphex.

ii. **Mimic.** *Mantispa* sp. Plate XIX. fig. 27.

**Model.** *Polistes sagittarius* (Sauss.). Plate XIX. fig. 26.

The Wasp, *P. sagittarius*, is an extremely common species and is rendered highly conspicuous by reason of a red band on the second abdominal segment; the rest of the body is black, varied on the head and thorax with a rich red-brown; the wings are fuscous, becoming flavo-hyaline outwardly. The mimic is black with the second and third abdominal segments red, the width of these two segments closely corresponding with the large second abdominal segment of the wasp; the wings are hyaline, but largely shaded with fuscous at the base and along the costal margins and flavo-hyaline at the apex (compare figs. 26 & 27). A closely allied species from Assam is in the Hope Collection at Oxford, with the MS. name of *M. nodosa* (Westw.). The specimen belonged to the Cantor Collection.

iii. **Mimic.** *Mantispa* sp. Plate XIX. fig. 25.

**Model.** *Polistes* sp. near *diabolicus* (Sauss.). Plate XIX. fig. 24.

The general colour of the Wasp is reddish-brown, the abdomen is covered with a fine silky pubescence golden in colour; this

<sup>1</sup> Ent. Month. Mag. (ser. 2) vol. xi. 1900, pp. 127–128.

pubescence is denser at the apices of the segments, forming here narrow yellow bands; the wings are flavo-hyaline, sometimes with a brown stigma.

The mimic is of a reddish hue, the abdomen is a little paler, corresponding to the red-brown seen through the golden pubescence of the wasp's abdomen; the apex of each segment is narrowly banded with yellow. The wings are broadly hyaline along the costal margins and there is a brown stigma. A closely allied species from Celebes is unnamed in the British Museum.

Both this and the preceding *Mantispa* were referred to Mr. R. McLachlan, who pronounced them to be undescribed species.

iv. **Mimic.** *Mantispa* ? *cora* (Newm.).

**Model.** *Mesostenus* sp.

A small black-and-yellow banded *Mantispa* was caught on the hill, Bukit Timah, at Singapore amongst short undergrowth, and at the same time I took also several specimens of a common Ichneumon-fly very similarly coloured. The *Mantispa* was extremely active on the wing and at first sight almost indistinguishable from its model. I append some colour notes on the two insects:—

*Mantispa*.—Ground-colour of head, thorax, and abdomen black, the following bands bright yellow—two vertical on the face, one transverse on the vertex, an anterior transverse and three longitudinal on the prothorax, one transverse on both meso- and metathorax, which are ventrally blotched with yellow; abdomen alternately banded black and yellow. Anterior legs yellow blotched with black, mid- and posterior femora broadly banded black and yellow. Bases of wings yellow and a distinct black stigma on the fore wings.

*Mesostenus* sp.—Head yellow; prothorax black bordered with yellow and with two central yellow stripes; mesothorax yellow with a central black spot; metathorax posteriorly yellow; abdomen banded alternately black and yellow. Legs yellow blotched with black. Anterior wings with a conspicuous stigma.

I subsequently found the same species of *Mantispa* or a close ally in Borneo, frequenting the blossoms of a Hibiscus; the plant was also visited in considerable numbers by a small yellow-and-black *Icaria* and by a similarly coloured ichneumon-fly; a somewhat careful scrutiny was needed to distinguish these insects one from the other.

### III. COLEOPTERA AS MIMICS.

I wish especially to acknowledge the kind assistance received from Mr. C. J. Gahan in working out this section of my paper.

Most of my examples are taken from the Longicornia, and I have drawn up tables of the mimetic species of the group occurring in Borneo. I have made these as complete as possible, but there are a few described species which I have not seen and which have



never been figured. Such species have been included in the appended tables, when their descriptions have shown that they do not differ in characters of mimetic importance from the closely allied species with which I am acquainted; in every case these are marked with an asterisk. I have not included a large concourse of species belonging to the subfamilies *Mesosinæ* and *Apomecyninæ*, which present in their general facies a marked resemblance to the Rhynchophora, for, although the tyro in entomology might readily mistake many of these longicorns for Rhynchophorous species, I have, nevertheless, found it quite impossible to pair any one given species with a definite model. The resemblance is in fact, as is so frequently the case, general and indefinite, not special as, for example, in the species of the subfamilies *Astatheinae* and *Saperdinae*, which mimic for the most part definite species of the Phytophaga. It will therefore suffice if I simply enumerate here those genera of the *Mesosinæ* and *Apomecyninæ* which present most markedly Rhynchophorous features:—

Subfam. *Mesosinæ*:—*Anancylus*, *Planodes*, *Ereis*, *Cacia*, *Mnemea*, *Sorbia*.

All these Coleoptera, more especially *Ereis anthriboides* (Pasc.), have a general resemblance to Anthribidæ.

Subfam. *Apomecyninæ*:—*Cenodocus*, *Synelasma*, *Etaxalus*, *Phesates*, *Praonetha*, *Sybra*, *Ropica*.

These bear a general resemblance to Curculionidæ.

#### NOTES ON TABLE I.—*Longicorns mimicking Hymenoptera.*

The subfamily *Phytæciinæ* furnishes ten and probably more species belonging to three genera which mimic the Braconidæ. The models can be divided into two sections:—(1) species with dark red head and thorax and black abdomen and wings (genus *Myosoma*); (2) reddish-ochreous species (genus *Iphiaulax*), one of which has already been shown to be mimicked by *Mantispa simulatrix*. *Scytasis nitida* (Pasc.) and four species of *Oberea* are coloured in identically the same way as their models, the red-and-black Braconids. Furthermore, *S. nitida* and three out of the four species of *Oberea* (the exception being *O. rubetra* (Pasc.)) are marked with a large white patch of pubescence on the sides of the first and second abdominal segments, which patches, when the beetle is seen in profile, give an impression of a wasp-like waist, from the posterior end of which the abdomen appears gradually to swell in size. This effect is shown in Plate XIX. figs. 13, 14, & 15, representing respectively *Oberea strigosa* (Pasc.) var., *O. brevicollis* (Pasc.), and *Oberea* probably n. sp. near *strigosa* (Pasc.). The thin waist of the model is not seen from above when the insect is at rest, being hidden by the laid-back wings, and consequently this obviates the necessity of dorsal white patches on the mimic as in the African Locustid *Myrmecophana fallax*, whose model is a wingless ant with an abdominal peduncle plainly



TABLE I.—*Longicorns mimicking Hymenoptera.*

Mimics.		Models.
Fam. LAMIIDÆ.	1. <i>Scytasis nitida</i> * (Pasc.).	Red-and-black Braconidae of the genus <i>Mjosoma</i> .
	2. <i>Obreia brevicollis</i> (Pasc.) (probably = <i>curialis</i> (Pasc.)).	
	3. " n. sp. between <i>macilentia</i> (Pasc.) and <i>strigosa</i> (Pasc.).	
	4. " <i>strigosa</i> (Pasc.) var.	
	5. " <i>rubetra</i> (Pasc.).	
	6. " sp. near <i>rubetra</i> (Pasc.) and probably a form of it.	Reddish-ochreous Braconidae of the genus <i>Iphiaulax</i> .
	7. " <i>insoluta</i> (Pasc.).	
	8. " <i>consentanea</i> (Pasc.).	
	9. " probably ♂ <i>consentanea</i> .	
	10. " n. sp.	
	11. <i>Napsierha</i> , n. sp.	
	12. <i>Glenea iredine</i> (Pasc.)	<i>Hylotoma pruinosa</i> (Camm.).
Fam. CERAMBYCIDÆ.	Subfam. <i>Callichrominæ</i> .	<i>Salix aurosericeus</i> (Guér.).
	13. <i>Nothopeus intermedius</i> (Gahan)	<i>Mynimia aviculus</i> (Sauss.)
	14. " <i>fasciaticornis</i> (Waterh.)	" <i>anthracinus</i> (Sm.).
	15. " sp. near <i>hemipterus</i> (Fab.)	<i>Mjosoma</i> sp.
	16. <i>Psenida brevipennis</i> (Gahan)	<i>Melipona vidua</i> .
	Subfam. <i>Necylatiniæ</i> .	Ants.
	17. <i>Epania singaporensis</i> (Thoms.)	"
	18. " <i>saravakensis</i> (Thoms.) *	"
	Subfam. <i>Tylomorphinæ</i> .	"
	19. <i>Halme cleriformis</i> (Pasc.)	
	20. <i>Clytellus westwoodi</i> (Pasc.)	

visible both in a dorsal and a profile view. A species of *Oberea* near *rubetra* (6), and probably a form of it, is really intermediate in character between these two sets of mimics, the elytra being brown anteriorly (basally) and black posteriorly. The remaining species of *Oberea* mentioned in the table mimic the reddish-ochraceous Braconids. *O. insoluta* and the species of *Nupserha* have a pale golden pubescence on the basal abdominal segments, and *O. sp.* (10) has a similarly situated greyish pubescence: in every case this coloration is not so effective as the white patches of *O. brevicollis*, &c.; but these unicolorous *Obereas* are so much more active on the wing, so much more Hymenoptera-like in their actions when resting on a leaf or twig, that when they are alive one is much more apt to mistake them for their models than their bicolorous congeners. In other words, these unicolorous *Obereas* compensate for the imperfection (from a mimetic point of view) of their coloration by their close approximation to the actions of their models. *O. consentanea* (8 & 9), *O. sp.* near *rubetra* (6), and *O. n. sp.* (10) have the elytra clothed with a delicate silky-grey pubescence, especially in the posterior two-thirds, the appearance varying according to the position in which the insect is held; and these species mimic Braconids with the outer third of the wings pale fuscous, the varying reflections of the elytra giving a similar impression to that produced by the semitransparent fuscous parts of the model's wings.

*Glenea iresine* (Pasc.) is a small blue species; the middle third of the elytra is brown, shading anteriorly into blue, posteriorly into greyish white; the model is a small blue *Hylotoma*, and when the wings are laid back the resemblance between the two species is striking; the blue anterior third of the beetle's elytra corresponds to the posterior part of the *Hylotoma's* thorax, the brown portion to the abdomen with the superposed wings, the greyish posterior third to the tips of the wings of the model, which project beyond the end of the abdomen.

Turning to the family Cerambycidae, we find that the sub-families *Callichrominae* and *Necydalinae* present in the reduction of the elytra a marked Hymenopterous appearance. *Nothopeus fasciatipectennis* (C. O. Waterh.) has already been figured and described (Trans. Ent. Soc. 1885, p. 369, pl. x.). *Nothopeus sp.* near *hemipterus* (Fab.) is a large black species with entirely fuscous wings, and is an admirable mimic of a formidable wasp, *Mygnumia anthracinus* (Sm.), which occurs commonly on Mt. Matang. The buzzing flight and other movements of these two *Nothopei* are remarkably wasp-like and so completely deceived the Museum collectors that they employed the greatest precautions in transferring the specimens from the net to the killing-bottle.

A magnificent new species, described by Mr. Gahan in Appendix II. as *Nothopeus intermedius* (Plate XIX. fig. 21), was captured near the summit of Mt. Penrissen together with several of its models, *Salix aurosericeus* (Guér.) (Plate XIX. fig. 20).

The general colour of the beetle is reddish ochreous, the prothorax is clothed with a fine golden pubescence; the prominent black eyes, the somewhat flattened antennae, and long hind legs closely correspond with the same organs of the *Salix*; further, the elytra, though not shortened, are much reduced in width, rapidly narrowing from a breadth of 3.5 mm. at the base to 1 mm. at the apex, so that the clear golden wings are very imperfectly hidden and add not a little to the general wasp-like appearance. When seized, this beetle curved down its abdomen in the most characteristic wasp-like manner, and it was only with the greatest reluctance and most careful precautions that my Dyak collectors, to whom I pointed out the insect, captured it. As in the *Obereas*, no representation has here been made in dorsal view of the wasp-waist of the model, and for the same reason, namely, that this is hidden, when the *Salix* settles, by its wings, and it is only at such periods of rest that the full effect of the deceptive resemblance can be appreciated; that part, however, of the first abdominal segment of the *Nothopeus* which is visible from the side and below is clothed with a golden-grey pubescence, which produces the same effect as in the *Obereas*.

It is possible that this species of *Nothopeus* is itself distasteful like the mimicked genera *Chloridolum* and *Leontium* (see later), but I could distinguish no pungent odour like that emitted by those genera, and I am inclined to think that its mimetic resemblance is its sole defence.

I have lately become acquainted with a mimetic species belonging to the subfamily *Necydalinæ* (Plate XIX. fig. 12, no. 16 in Table I.), described in Appendix II. as *Psebena brevipennis*, and I therefore add some details of its habits and of the mode in which the mimetic resemblance is attained. The species in question mimics with a remarkable degree of accuracy one of the common red-and-black Braconidæ: these Hymenoptera, as already shown, serve as models to a considerable number of species of *Oberea*, but in none of these latter is a Hymenopterous appearance so admirably borne as in this, a member of a subfamily for the most part characterized by a reduction of the elytra. The head and prothorax are of an Indian red, the wings are purplish-black, the two anterior pairs of legs are testaceous, the long slender posterior pair black with the bases of the femora white; the body is so slender that the necessity of producing a wasp-waisted effect by means of lateral white patches, as in some of the above-noted *Obereas*, can be dispensed with.

Most of the life of this beetle, as in all Longicornis with reduced elytra, is spent on the wing, when it is simply indistinguishable from its model; when it comes to rest the resemblance is still remarkably exact, and its quick restless movements and habit of flickering the antennae in all directions are very Bracon-like. No specimen at all resembling this remarkable species has hitherto existed in the British Museum.

Of the *Necydalinæ*, one species *Epania singaporensis* (Plate Proc. Zool. Soc.—1902, Vol. II. No. XVI. 16

TABLE II.—*Longicornus* mimicking other Coleoptera.

Mimics.		Models.	
Subfam. <i>Mesosinæ</i> .	1. <i>Elelea coucinna</i> (Pasc.)	<i>Arrhenodes</i> sp.	Fam. BRENTIIDÆ.
	2. <i>Zelota spathomelina</i> (Gah.)	<i>Spathonodes</i> sp. near <i>turritus</i> (Gerst.).	Fam. EXDOMYCHIDÆ.
Subfam. <i>Dorcadioninæ</i> .	3. <i>Trachystola granulata</i> (Pasc.)	<i>Sipalus granulatus</i> (Fab.).	Fam. CURCULIONIDÆ.
	4. <i>Alibora</i> sp. 5. <i>Egoprepis insignis</i> (Pasc.) 6. <i>Ectatusia moorci</i> (Pasc.) 7. <i>Dynascus porosus</i> (Pasc.)	<i>Baryrhynchus delicatus</i> (Sch.). <i>Diurus sylvanus</i> (Senna). " <i>shelfordi</i> (Senna). " <i>forcipatus</i> (Westw.).	Fam. BRENTIIDÆ.
	8. <i>Stegenus dactylon</i> (Pasc.)	" <i>sylvanus</i> (Senna).	
Subfam. <i>Saperdinæ</i> .	9. <i>Entelopes glauca</i> (Guér.)	Coccinellid, e. g., <i>Caria dilatata</i> (Fab.).	Fam. COCCINELLIDÆ.
	10. " n. sp. near <i>wallacæi</i> (Pasc.)	<i>Metrioidea apicalis</i> (Jhc.) var.	Fam. GALERUCIDÆ.
	11. " <i>ioptera</i> (Pasc.) *	<i>Cariilheca</i> sp. near <i>mouhoti</i> . Perhaps variety only.	
	12. " <i>amana</i> (Pasc.)	<i>Aulacophora boisduvali</i> (Baly).	
	13. <i>Serixia aurulenta</i> (Pasc.)	<i>Ænidia</i> sp.	Fam. LYCIDÆ.
	14. " <i>prolata</i> (Pasc.)		
	15. <i>Xyaste invida</i> (Pasc.)	<i>Melampyrus acutangulus</i> (Bourg.).	
	16. " <i>torrida</i> (Pasc.)	<i>Ditaneæ</i> sp. near <i>fuscicornis</i> (Gorh.).	
	17. " <i>funosa</i> (Pasc.)	Same model as 15.	

## LAMIDÆ.

- { 18. *Astathes unicolor* (Pasc.) .....  
 19. " *posticatus* (Thoms.) .....  
 20. " *flaviventris* (Pasc.) .....  
 21. " *splendida* (Fab.) .....  
 22. " *caloptera* (Pasc.) .....  
 23. *Tropimetopa simulator* (Pasc.) .....  
 24. *Ochroceus enanias* (Pasc.) .....  
 25. *Chronoma*, n. sp. ....  
 26. " *tubida* (Pasc.) .....

Subfam.  
*Astathinae*.

- { 27. *Daphisia pulchella* (Pasc.) ..... {

Subfam.  
*Phytectinae*.

*Callimerus bellus* (Gorh.).  
 " *catenatus* (Gorh.).

Fam. CLERIDÆ.

- { 28. *Ephies dilaticornis* (Pasc.) ..... {

Subfam.  
*Lepturinae*.

*Metriorrhynchus kirschi* (C. Waterh.).

- { 29. *Erythrurus apiculatus* (Pasc.) var. .....  
 30. " *rotundicollis* (Gahan) .....  
 31. " *sternalis* (Gahan) .....  
 32. " *biapicatus* (Gahan) .....  
 33. *Pygrestes eximius* (Pasc.) .....

Subfam.  
*Pygrestinae*.

*Lycostomus gestroi* (Bourg.).  
 " " "  
*Metriorrhynchus kirschi* (C. Waterh.).  
 " *dispar* (C. Waterh.).

Fam.  
LYCIDÆ.

- { 34. *Erythrurus viridipennis* (Gahan) ..... {

*Prionocerus ceruleipennis* (Perty).

Fam. MELYRIDÆ.

- { 35. *Collyrodes lacordairei* (Pasc.) \* ..... {

Subfam.  
*Sesigrinae*.

*Collyris* sp.

Fam.  
CICINDELIDÆ.

- { 36. *Sclerurus amarus* (Gory) ..... {

*Tricondyla gibba* (Chaud.), var. *cyanipes*.

## CERAMBYCIDÆ.



XXIII. fig. 40, no. 17 in Table I.), with its swollen pedunculate posterior femora and white-tipped wings, resembles very closely the common little Dammar-bee *Melipona vidua* (Lepel.) (Plate XXIII. fig. 41); it is remarkably active on the wing and has doubtless often been passed over by collectors, the least important of its foes. *E. sarawakensis* (18) Wallace found crawling on timber, and stated "that they were remarkably ant-like"; in this species the posterior femora are not swollen.

Of the *Tillomorphinæ*, *Clytellus westwoodi* (20) and *Halme cleriformis* (19) are almost indistinguishable from ants.

#### NOTES ON TABLE II.—*Longicorns mimicking other Coleoptera.*

Excluding, for reasons already mentioned, the subfamilies *Mesosinæ* and *Apomecyninæ*, it will be seen that the *Saperdinæ* and *Astatheineæ* are essentially the mimetic subfamilies in this section. Most of the species are extremely common and highly conspicuous, and I have little doubt but that all are distasteful, and therefore furnish examples of synaposematic coloration (Müllerian mimicry). All the species of the genus *Entelopes* are mimetic. *E. glauca* (Guér.), red with black spots (Plate XXIII. fig. 32), is quite Coccinellid in appearance (compare fig. 30), though more by virtue of its markings than of its shape. This association of red colour with black spots is so typically a warning coloration, as exemplified by scores of species of Coccinellidæ, that it is impossible to regard the same pattern on a Longicorn as anything but pseudaposematic or synaposematic. *Entelopes* n. sp. near *wallacei* (Pasc.), an entirely reddish-fulvous species, has as its model similarly coloured species of the family Galerucidæ, *Metrioidea apicalis* (compare figs. 13 & 14, Plate XX.), which, as will be seen, serves also as model for two species of the *Astatheineæ*. *Entelopes ioptera* (Pasc.), with its yellow prothorax and blue elytra, and *Entelopes amœna* (Plate XX. fig. 26), with reddish prothorax and blue elytra, also find parallels amongst the distasteful Galerucidæ (see the accompanying Table, pp. 242, 243; also Plate XX. fig. 25). *Serixia modesta* (Pasc.) and *S. lychnura* (Pasc.) are unlike any distasteful species with which I am acquainted; the closely-allied *S. prolata* (Plate XX. fig. 12) and *S. aurulenta* (Pasc.) mimic a small reddish-fulvous Galerucid, *Anidia* sp. (Plate XX. fig. 11). The genus *Xyaste* is interesting as it mimics beetles of quite a different nature—the Lycidæ, whose distastefulness I have proved by repeated trials with various small mammals and birds. *Xyaste* is generically separated from *Serixia* by the thickened and pilose basal joints of the antennæ; the remaining joints, being of exceeding fineness, are more or less inconspicuous; and it is by this means that the thickened, flabellate, and short antennæ of the Lycidæ are simulated, whilst *Ephies dilaticornis* (Plate XXIII. fig. 18) and *Erythrus apiculatus* var. (Plate XXIII. fig. 8), also mimetic of Lycidæ, have the antennæ shortened and dilated in almost the same manner as their

models. *Xyaste invida* (Plate XXIII. fig. 26) and *X. fumosa* (Plate XXIII. fig. 25) are black with the basal half of the elytra reddish; a similarly coloured Lycid model, *Melampyrus acutangulus* (Bourg.) (Plate XXIII. fig. 23), is common round Kuching. *X. torrida* (Pasc.) is brownish-testaceous with a corresponding brownish-testaceous model—*Ditoneces* sp. (Plate XXIII. fig. 29). Of the Astatheinæ, *Astathes unicolor* (Pasc.) (= *coccinea* Pasc.), a large species with purplish reflections on the elytra (Plate XX. fig. 18), has unmistakable models in similarly coloured Galerucids—*Antipha* sp. and *Ochralea nigripes* (Plate XX. fig. 17). The next three species—*A. posticalis* (Plate XX. fig. 22), *A. flaviventris* (Pasc.), *A. splendida* (Plate XX. fig. 20)—all closely resemble each other, being dark shining blue anteriorly, red posteriorly; *flaviventris*, as its name signifies, has a yellow abdomen, whilst *splendida* has a red head and prothorax. The latter species mimics an equally resplendent Galerucid—*Caritheca mouhoti* (Plate XX. fig. 19), and the slight differences between *A. flaviventris* and *A. posticalis* are paralleled in two closely-allied Galerucids—*Antipha abdominalis* (Jac.) and *A. ?nigra* (Alld.) var. (Plate XX. fig. 21), the former of which alone has a yellow abdomen. *A. caloptera* (Pasc.), a blue species, finds a model in *Haplosonyx albicornis* (Wied.) (compare figs. 23 & 24, Plate XX., and see explanation of this Plate for a few further examples given in Table II. but not again mentioned in the text).

The remaining genera of the subfamily, as represented in Borneo, have corresponding models, also among the Galerucids, the resemblance between *Ochrocesis evanida* (Pasc.) and its model, *Hoplasoma unicolor* (Ill.) var. *ventralis* (Baly), being very exact. All these genera—*Tropimetopa*, *Chreonoma*, and *Ochrocesis*—are unicolorous, and form with the unicolorous *Saperdinæ* and numerous<sup>1</sup> Galerucids and Halticids a large group of similarly coloured beetles, all of which I consider to be distasteful.

The subfamily *Hippopsinæ* contains four species, each mimetic of a species of the Rhynchophorous family Brenthidæ. The first, *Alibora* sp., mimics *Baryrrhynchus dehiscens* (Sch.) (compare fig. 3 with 1 & 2, Plate XX.). The general colour of both model and mimic is a rich chestnut-brown, variegated on the elytra with bright yellow streaks and spots; the three basal joints of the antennæ of the Longicorn are clothed biramously with long and close-set hairs. In the natural attitude the elongated scapes are closely pressed together, the remaining joints gradually diverging, the result being a remarkable resemblance to the head with its elongated rostrum and shorter antennæ of the Brenthid, which only a closer examination proves to be deceptive; the short legs of the mimic add still further to the resemblance.

All the other three species of *Hippopsinæ* mimic extremely common species of the Brenthid genus *Diurus* (Plate XX.

<sup>1</sup> I have not included in the table all the unicolorous Galerucids and Halticids with which I am acquainted; those that are included are merely typical examples.

figs. 4, 5, 6). The Brentheids are extremely variable in both sexes, in the matter of size, in the shape and length of the terminal processes of the elytra, and in the amount of scaling on the head and antennæ. The three species here noted range in length from .75 in. to 1.5 in.; and it is of exceptional interest that three mimetic Longicorns of sizes corresponding closely to these forms should be found in a more or less closely circumscribed area, and all belonging to the same subfamily.

In the first couple *Diurus sylvanus* (Senna) (a female) measures 1.5 in. in length, and the mimic *Ægoprepis insignis* (Pasc.) is of corresponding length (compare figs. 4 & 7 on Plate XX.). Both species are dark brown, relieved with pale ochreous streaks and spots; the Brenthid has the prothorax and elytra densely and deeply punctured, the punctures on the elytra being arranged in close-set rows. Both on the prothorax and elytra each puncture is occupied by a peculiar scale, lenticular in shape and pale ochreous in colour; these produce the pale ochreous streaks characteristic of the beetle (fig. 4a). The head and antennæ are covered by similar scales, more closely set and not imbedded in punctures; each elytron terminates in a somewhat sharp point, the homologues of the long, narrow, terminal processes of the male.

The mimic has the ground-colour of the prothorax and elytra black, and their dorsal surfaces are covered with tufts of a fine pale ochreous pubescence (fig. 7a); these represent very well the scales of the Brenthid, and a very similar mottled appearance is thus produced in both species by totally different means. The elytra of the Longicorn do not terminate in sharp points corresponding to the points of the Brenthid's elytra, as in the two species mentioned below. The rostrum of the model is slightly longer than in *Baryrhynchus dehiscens*, but the antennæ are shorter and thicker; and similarly we find that the antennæ of the mimic, which, when carried in the natural attitude (*i. e.*, pointing forward and closely apposed), simulate the rostrum and antennæ of the Brenthid, are plumose for a greater part of their length than in *Alibora* sp., whilst the free portion is short and thick, not long and setaceous as in the *Alibora*. Both model and mimic were taken on a fallen log close together.

*Ectatosia moorei* (Pasc.) is a mimic of *D. shelfordi* (Senna) (♀), a species of medium size, 1 inch in length (compare fig. 10 with 6 and 10a with 4a on Plate XX.). The simulation is as perfectly carried out and by the same means as in *Ægoprepis insignis*, with this addition, that the elytra terminate in sharp points corresponding to the same points in the Brenthid. The length of the mimic from elytra tips to termination of the plumosity of the antennæ is approximately the same as the length of the model from elytra tips to tip of the rostrum.

Another and a smaller species, *Dymascus porosus* (Pasc.) (Plate XX. fig. 9), mimics—again by the same means—a small *Diurus forcipatus* (Westw.) measuring only .75 inch in total length

(fig. 5). The model may be a male or female, as in such small-sized specimens the male does not bear the long elytral processes characteristic of large or medium-sized varieties, the elytra are merely produced into short points; these short points are mimicked by the Longicorn very exactly.

*Stegenus dactylon* (Pasc.) of the subfamily *Agniinae* is also a fair mimic of a large-sized *Diurus sylvanus* (compare figs. 8 & 4 on Plate XX.). As in *Egoprepis insignis*, the body is blackish-brown streaked with a pale ochreous pubescence (fig. 8 a); the basal two-thirds of the antennæ are clothed with a dense black plumosity; the remaining joints are ochreous and pale in colour.

*Elelea concinna* (Pasc.), one of the *Mesosinae*, also mimics in the same manner a small Brenthid, *Arrhenodes* sp., as previously noted by Wallace, who remarks that it carried its antennæ "straight and close together, appearing like a Brenthid."

Another of the *Mesosinae*—*Zelota spathomelina* (described by Mr. Gahan in Appendix I. to this memoir)—mimics an Endomychid, a species of *Spathomeles* near *turritus* (Gerst.) (compare figs. 57 & 56, Plate XXIII.). The model, which is not represented in the British Museum collections, is pitchy-black with two reddish spots on each elytron; springing from each elytron is a stout spine directed somewhat forwards, forming a very efficient defence against the attacks of enemies. It is not improbable, moreover, that this beetle is still further protected by some distasteful properties, which, at any rate, are possessed by the species of the genus *Eumorphus* of the same family, an assemblage of black or purplish insects with conspicuous yellow spots. All of these possess a very pungent though not altogether disagreeable odour, whilst many exude a yellowish acid fluid when seized. The mimic of the *Spathomeles* is coloured in much the same way as its model: on each elytron there is a mamilliform prominence, from which springs a pointed tuft of delicate hairs, which is curved slightly forwards. These tufts so closely resemble the formidable spines of the model that a near inspection with lens and finger is necessary to reveal the deception. Another Endomychid beetle, *Amphisternus mucronatus* (Gerst.), is also a probable model of the same species of Longicorn.

The aberrant *Trachystola granulosa* (Pasc.), which was placed provisionally in the subfamily *Dorcadioninae*, with its deeply punctured and granulate elytra, presents the general appearance of a large black Curculionid, such as *Sipalus granulatus* (Fab.), without, however, exhibiting any very highly modified mimetic characteristics, as in the species previously discussed.

*Daphisia pulchella* (Pasc.) is a highly conspicuous little beetle of the subfamily *Phytæciinae*, and is almost indistinguishable from two species of Clerid of the genus *Callimerus* (compare fig. 55 with figs. 53 & 54 on Plate XXIII.).

[The resemblance of the Cleridæ as a group to widely different Coleoptera and to insects of other orders is well known. Looking



through the fine collection in the Hope Department, two chief types of deceptive coloration were seen to be predominant, viz., that of Mutillidæ and Cantharidæ. While the constant repetition of a single very distinctive Hymenopterous type is remarkable, it must not be forgotten that the Cantharid appearance, orange with black transverse bands, is furthermore strongly suggestive of one of the commonest and most conspicuous types of colouring in the Hymenoptera Aculeata. In addition to these predominant types other deceptive resemblances were common, viz., to Phytophaga, Lycidæ, ants, and apparently, in the case of certain Australian species, to Cetoniidæ. All the species of the interesting genus *Allochotes* (Westw.) were Coccinelliform. The interesting question arises as to whether these resemblances are Batesian (pseudaposematic) or Müllerian (synaposematic). The latter interpretation is strongly supported by the interesting discovery by Mr. Shelford of the mimicry by the Longicorn *Daphisia* of two species of the Clerid genus *Callimerus*, possessing an independent warning coloration. The conspicuous appearance, abundance, and habits of the species of this genus are entirely consistent with the explanation of their colours and pattern as aposematic. Fig. 49 on Plate XXIII. shows a Clerid, *Tillicera* sp., resembling a Mutillid, near *Urania* (Sm.) (fig. 48); fig. 52 a Clerid, *Tenerus sulcipennis* (Gahan), resembling a Lycid, *Metriorrhynchus atrofuscus* (fig. 50 & 51); while figs. 53 and 54 show the Clerid species of *Callimerus* resembled by the Longicorn. The whole group was obtained by Mr. Shelford from the vicinity of Kuching, and it strongly suggests that the Clerid mimics (figs. 49 & 52) are really synaposematic.—E. B. P.]

In the Cerambycidæ, *Collyrodes lacordairei* (Pasc.) is the most remarkable mimic of the Cicindelan genus *Collyris*. *Sclethrus amoenus* (Gory) is also remarkably like the genera *Tricondyla* and *Collyris* with its dark blue body and bright red legs, of which the hind pair are considerably elongated (compare fig. 11 with 5 and 3 on Plate XIX.). It is much less common than its model, but is found in the same situations and always tries to escape its captor by running swiftly just like the *Tricondyla*. The other five species mentioned in this section of the table, *Ephies dilaticornis* (Pasc.), the three species of *Erythrus*, and *Pyrestes eximius* (Pasc.), mimic species of the Lycidæ (see group of figs. 4 to 8, 12, 19, Plate XXIII.). *P. eximius* with its elongated prothorax is perhaps less Lycid in appearance than the other species.

*Erythrus viridipennis*, with black head, red thorax, and green elytra, is a mimic of one of the Melyridæ, similarly coloured, *Prionocerus ceruleipennis* (Perty) (Plate XXIII. figs. 58 & 59). All these species of *Erythrus* were taken in great abundance on Mt. Matang, and I am strongly of opinion that the entire subfamily *Pyrestinae* is a distasteful one: the mimicry in this case is therefore Müllerian. *Ephies dilaticornis*, on the other hand, I am inclined to regard as a Batesian mimic; it is rare, a closer mimic, and belongs to an essentially mimetic subfamily (cf. Table III.).



TABLE III.-- *Longicornis* mimicking *Longicornis*.

Mimics.		Models.	
Subfam. <i>Acanthochininae</i> .	{ 1. <i>Driopea clytina</i> (Pasc.) *	<i>Clytanthus</i> sp.	Subfam. <i>Clytinae</i> .
	{ 2. <i>Cylindropomus peregrinus</i> (Pasc.)	<i>Xylotrechus pedestris</i> (Pasc.).	
	{ 3. " comis (Pasc.) & sp. near it	<i>Chlorophorus (Clytanthus) annularis</i> (Pasc.).	Subfam. <i>Callichrominae</i> .
	{ 4. Gen. ? and sp. ?	<i>Chloridolum thomsoni</i> (Pasc.) & sp. near it.	
Subfam. <i>Phyllacinae</i> .	{ 5. <i>Daphisia</i> sp.	<i>Chlorophorus annularis</i> (Pasc.).	Subfam. <i>Clytinae</i> .
	{ 6. " sp.	<i>Demonax viverra</i> (Pasc.).	
	{ 7. <i>Ossoris clytomina</i> (Pasc.)	<i>Clytanthus sumatrensis</i> (Lap. & Gor.).	Subfam. <i>Callichrominae</i> .
	{ 8. <i>Cryllis elyptoides</i> (Pasc.)	" "	
Subfam. <i>Gemininae</i> .	{ 9. <i>Chlorisanis viridis</i> (Pasc.) *	<i>Chloridolum thomsoni</i> (Pasc.) & sp. near it.	Subfam. <i>Clytinae</i> .
	{ 10. <i>Xystrocera alcyonca</i> (Pasc.)	<i>Chloridolum thomsoni</i> (Pasc.) & sp. near it.	
	{ 11. <i>Psaltanta chalybeata</i> (Pasc.) *	<i>Chloridolum</i> sp.	Subfam. <i>Clytinae</i> .
	{ 12. <i>Leptura</i> probably n. sp.	<i>Chloridolum cinnyris</i> (Pasc.).	
Subfam. <i>Lepturinae</i> .	{ 13. " sp. near <i>histrionica</i> (Pasc.)	<i>Xylotrechus decoratus</i> (Pasc.).	Subfam. <i>Clytinae</i> .
	{ 14. " sp.	<i>Demonax mustela</i> (Pasc.).	
	{ 15. <i>Polyphida clyptoides</i> (Pasc.) *	<i>Demonax viverra</i> (Pasc.).	Subfam. <i>Clytinae</i> .

Fam. LAMIIDÆ.

Fam. CERAMBYCIDÆ.

In the Cerambycidae, the antennae present great diversity of form—flabellate in *Cyriopalus*, thickened in *Epipedocera* and *Ephies*, short in *Demonax*, *Clytus*, and many other genera, enormously elongate in *Neocerambyx aeneas*; and we find, perhaps as a consequence of this plasticity of the antennal form, a close resemblance in structure and external appearance between the antennae of the mimetic Cerambycidae and their models (e.g., compare antennae of *Nothopeus intermedius* and *Ephies dilaticornis* (Pasc.) with the antennae of *Salix aurosericeus* and the Lycid *Metriorrhynchus kirschi* (C. Waterh.) respectively): whereas in the family Lamiidae, nearly all the members of which are characterized by setaceous or linear antennae, the simulation of the differently constructed antennae of their models, if attained at all, is not brought about by actual resemblances in form, but by such devices as pilosities, modes of holding, or the thinning away of a portion of the length until it becomes almost invisible in comparison with a specially thickened portion (compare the antennae of *Alibora*, *Egoprepis*, &c., and of *Xyaste invida* with those of their respective models).

#### NOTES ON TABLE III.—*Longicorns mimicking Longicorns.*

The only two subfamilies of the Longicornia which serve as models to the other subfamilies are the *Callichrominae*, a group of metallic-green beetles protected by a powerful odour, which is produced by glands behind the metasternum opening to the exterior by two pores, and the *Clytinae*. This latter subfamily includes the well-known *Clytus arietis* (L.), mentioned in many works on natural history as mimetic of a wasp. Whether this is a case of Müllerian or of Batesian mimicry can only be proved by experiment, but I am quite confident that the Bornean representatives of the group are all highly distasteful. The extremely conspicuous and strikingly coloured *Chlorophorus* (*Clytanthus*) *annularis* (Plate XX, fig. 31) was the commonest beetle on Mt. Penrissen at all elevations: some shrubs simply swarmed with it, while its movements and its very presence in such numbers spoke eloquently of some protective characteristic. Species of the genus *Demonax* were almost equally common on the mountain, whilst around Kuching the species *Clytanthus sumatrensis* (Plate XX, fig. 37) and *Demonax viverra* (Plate XX, fig. 35) are amongst the commonest Longicorns met with. Such few experiments as I have conducted have yielded negative results. During my collecting expedition to Mt. Penrissen I naturally had no tame animals with me, and therefore was unable to experiment with *Chlorophorus annularis*, whilst in Kuching the species of *Demonax* and *Clytanthus*, though common enough, are never obtainable in large enough quantities at one time, a very necessary consideration when one experiments with that most inquisitive of animals, the common Macaque (*Macacus cynomolgus*),

which will devour a single specimen of beetle or butterfly entirely for the sake of curiosity, only manifesting disgust or the reverse when that curiosity is fully satisfied.

Of the mimicking species it is not necessary to say much, their resemblances to their models being in every case most obvious.

Amongst the Lamiidæ, the *Phytocinæ* again yield the majority of mimetic species (a newly-discovered *Daphisia*, yellow in colour, is banded with black in almost identically the same manner as *C. annularis*) (compare figs. 34 & 31 on Plate XX.); and amongst the Cerambycidæ, the *Lepturinae* are also fruitful in this respect. One species of *Leptura*, with reddish head and prothorax and yellow black-banded elytra, is closely similar to *Demonax mustela* (compare figs. 40 & 39, Plate XX.): another species allied to *Leptura histrionica* (Pasc.), black with cream-coloured bands, is not readily distinguishable from *Xylotrechus decoratus* (compare figs. 42 & 41) and one or two species of *Demonax*. Plate XX. and its explanation should be consulted for the representation of other examples given in Table III. but not further indicated in the text. *Polyphida clytoides* (Pasc.), *Psalanta chalybeata* (Pasc.), and *Chlorisanis viridis* (Pasc.) I have never seen, but good figures of them are published in Pascoe's paper on the Longicornia Malayana (Trans. Ent. Soc. ser. 3, vol. iii.). The remaining mimics of the iridescent green *Callichrominae*, viz. Nos. (4), (10), and (12) in Table III., are shown in figs. 47, 48, and 44 on Plate XX. and their models in figs. 45, 46, and 43.

[The mimetic resemblance to the *Clytinae* exhibited by so many species of distantly related Bornean Longicorns is of extreme interest. The widespread species of this dominant group have developed, in a great majority of cases, a black and yellow or black and orange transverse banding, which superficially resembles the characteristic appearance of wasps and hornets. This rough resemblance is further heightened by the active movements of the living beetle, which suggest those of a Hymenopterous rather than a Coleopterous insect. Such an appearance is found in *Clytinae* of many species from the whole Palearctic and Nearctic belt, from Mexico, Malaya, Australia, and probably many other countries. An Australian species, *Arideus thoracicus* (Donovan), has the deep brownish-orange colour of the alternate stripes, as well as the comparatively few broad black bands which are characteristic of wasps from the same region. *Clytanthus sex-guttatus* (Lucas) from Morocco suggests the appearance of a Mutillid or perhaps a Clerid with a Mutillid form of colouring. The Bornean *Sclethrurus amoenus* (Gory) mimics the aggressive Coleopterous *Tricondyla* (Cicindelidæ), while species of the *Tillomorphinae*, allied to the *Clytinae*, mimic ants, e. g., *Euderces picipes* (Fab.) of N. America and *Clytellus westwoodi* (Pasc.) of Borneo. Thus we witness within the limits of one large group of Coleoptera a great development of mimicry of aggressive specially protected forms. Such mimicry has been hitherto assumed to be Batesian (pseudaposematic), although the dominance

of the group in which it is manifest, the abundance and wide range of individuals in the species as well as of the species themselves, together with the remarkable predominance of mimetic resemblances among them—all tended to create a strong suspicion that the mimicry is Müllerian (synaposematic). This suspicion is now justified. The discovery of many Bornean Longicorn mimics of *Clytinae* renders it in every way probable that the group is specially defended by some unpalatable quality, and sometimes develops warning colours of its own which are deceptively resembled by other beetles, although it usually makes use of warning colours which are common to more aggressive and even more highly-protected insects. Thus the conclusions which were found to hold in the case of the Cleridæ (p. 248) also apply, with equal probability, to the *Clytinae*. Since the above was written Mr. Gahan has shown me a beautiful example of Batesian or Müllerian mimicry within the group of *Clytinae*, the common *Demonax walkeri* (Pasc.) being resembled in the closest manner by the rarer *Perissus myops* (Chev.). Both beetles had come to the British Museum in a single consignment from Ceylon. There is similarly a very remarkable resemblance, probably Müllerian, between *Xylotrechus pedestris* and *Demonax viverra* (compare figs. 29 & 35 on Plate XX.).—E. B. P.]

#### COLEOPTERA OTHER THAN LONGICORNS AS MIMICS.

**Mimic.** *Tillicera* sp., near *bibalteata* (Gorh.) (Fam. Cleridæ).  
Plate XXIII. fig. 49.

**Model.** *Mutilla* sp. near *urania* (Sm.). Plate XXIII. fig. 48.

The *Mutilla* has a red head and thorax and black abdomen, the second abdominal segment bears a white spot, the third segment is covered with a creamy white pubescence. In the beetle, the eyes and front of head are black, the vertex of the head and the prothorax are red; the elytra are black with one white band replacing the white spot and another sub-apical band paralleling the white abdominal segment of the *Mutilla*. Curiously enough, the male of this species of *Mutilla* bears a white band in place of a white spot, and hence the beetle more closely approaches the male than the female in its markings: still there is no question as to which sex serves as the model in this case.

Several specimens of the same species of *Tillicera* and of a closely-allied one are in the Hope Collection, Oxford, all collected by Dr. A. R. Wallace in Sarawak.

#### IV. LEPIDOPTERA AS MIMICS.

So much has been written, by abler pens than mine, on mimicry amongst the Eastern Lepidoptera *inter se*, that I have confined myself to drawing up merely a table of such mimetic species as occur in Borneo, with the addition of a few notes on the bionomics of certain species. Three remarkable examples of lepidopterous



mimics which came under my observation—namely, a sphingid larva mimicking a snake, a noctuid larva mimicking an ant, a moth mimicking a plant-bug—deserve, however, further notice and are here described at length.

i. **Mimic.** Larva of *Chærocampa mydon* (Walk.).

**Model.** A Snake, e. g. *Dendrophis picta* (Gm.).

I must confess that I have always hitherto regarded as somewhat fanciful those recorded cases of lepidopterous larvæ mimicking snakes and other vertebrate animals, though experiments have shown that the resemblances, even when imperfect, serve to rouse respectful curiosity, if not actual terror, in prospective enemies. I was therefore singularly delighted to secure a larva whose resemblance to a snake was so startlingly accurate that I was for a moment completely deceived.

The general colour was a dark olive-brown, becoming lighter anteriorly: the head, the first and second and the dorsal surface of the third and fourth segments were pinkish; at the junction of the third and fourth segments on each side was an ocellus, not a huge black disc, out of all proportion to the mimicked head, as in all the recorded similar examples, but of very nearly the exact size of the eye in such a snake as *Dendrophis picta*: the lower border of this was margined with bright gold (the colour of the iris in many snakes), giving an upward look and a most malevolent cast to the countenance; the black of the ocellus was so intense and glossy that an idea of depth was given, and it was difficult to believe that one was not looking through a cornea into a pupil. Running through the ocellus on each side was a broad black stripe exactly as in *Dendrophis picta*, while a wrinkled fold on each side of the lower half of the second, third, and fourth segments gave an admirable impression of the division between the upper and lower jaws of a snake. Not the least remarkable of these extraordinary devices was the flatness of the area bounded by the two "eye-stripes" on the dorsal surface of the third and fourth segments; this area together with the first and second segments were pink, reticulated with fine brown lines and strokes, giving an impression of the scutes on a snake's head; they were particularly well-marked on the first and second segments, being there more distant and distinct, and looking extremely like the divisions between internasal and præfrontal shields.

When the larva was moving about with the anterior segments well expanded, the resemblance to a snake was not so startling, but directly it was touched the terrifying attitude was assumed, the anterior segments being drawn in and the front of the body turned towards the aggressor; when, at the same time, the posterior part of the body was hidden by leaves the deception became complete, and if effective enough to deceive, even temporarily, a human being, it must surely be equally effective in deterring less highly organized and more timid foes.



Unfortunately I was unable to test the efficacy of the disguise for fear of losing the larva, which I was anxious to rear for the purpose of identification.

ii. **Mimic.** *Larva of a Noctuid Moth* (? Genus *Tinolius*).

**Model.** An Ant, *Ecophylla smaragdina* (Fab.).

In Jan. 1900 a curious Noctuid larva of the subfamily *Quadri-fineæ* was pointed out to me by Mr. H. N. Ridley in the Botanic Gardens, Singapore, resting on a leaf of a tree much frequented by the common red ant *Ecophylla smaragdina*.

Nearly all the segments of the body are furnished with fragile tentacle-like processes which are capable of quivering movements, and so loosely attached that very careful handling was necessary to secure a perfect specimen.

The arrangement of these tentacles is as follows:—

- Segment 1. 3 pairs: 1 pair lateral, 2 pairs dorsal pointing forwards.
- „ 2. 3 pairs: 1 pair lateral, 1 pair sub-lateral, 1 pair dorsal.
- „ 3. 2 pairs lateral.
- „ 4. Unprovided with tentacles.
- „ 5–10. Each with 1 lateral pair.
- „ 11. 2 lateral pairs.
- „ 12. 1 lateral pair.
- „ 13. 2 lateral pairs, the most anterior being very delicate, the most posterior strong and curved backwards.

Segment 8 is dorsally produced into a sharp-edged prominence. The anal prolegs are somewhat disproportionately large and can be widely divaricated; just above each is a prominent black spot: the colour of the body is brown of the exact shade of the *Ecophylla*, with a narrow yellow line on each side. When the larva is irritated, the posterior part of the body is immediately reared in the air, the anal prolegs are thrown widely apart and the tentacles, especially the most posterior pair, are violently agitated. When the caterpillar is seen in an end-on position or when the anterior two-thirds of the body are hidden, the resemblance to the ant is positively startling: the black eye-spots represent the eyes, the widely-diverging anal prolegs, the gaping jaws and the tentacles, the antennæ and legs of the model; the posterior pair of tentacles are so curved that they represent very accurately the elbowed antennæ of the ant.

It might be thought essential, in cases of mimetic lepidopterous larvæ such as the two examples just described, that the greater part of the body should be concealed in order perfectly to deceive prospective enemies: for example, in the sphinx-moth larva it is only the head of the snake that is copied, but is it necessary for the larva, in order to obtain immunity, that it should conceal its disproportionate shortness of body, thus arguing for it a degree

of appreciation of its shortcomings with which such lowly organisms are not usually credited? It seems to me more reasonable to compare such mimetic examples to the pictures of a painter, who strives not to make an exact copy of a scene or object, but to give an essential idea or impression of it, unintelligible perhaps to many, but full of significance to those for whom a picture is more than a mere photograph in colours.

[It is not necessary to adopt the improbable view that the caterpillar has any "appreciation" of the situation, even if we may reasonably believe that the mimetic resemblance is aided by partial concealment. A larva living among leaves is apt to be partially concealed by them and to be protected by the concealment. The appropriate attitude would arise through natural selection without the intervention of intelligence on the part of the larva.—E. B. P.]

The *Ecophylla*, one would imagine, has firmly established a reputation for ferocity, and consequently the mimicking Geometer larva can the more easily deceive its enemies, in spite of its too elongate body. Only two specimens were found, both were walking on leaves and were readily distinguishable; but the violently threatening attitude each assumed when irritated was unmistakable, and the resemblance of the elevated posterior end to the ant so striking, that it is difficult to imagine how a lizard or frog with a previous experience of the ant could fail to be deterred.

I shall have later to draw attention to a Spider which mimics the same ant, but this is a case with a different significance, viz., that the mimic may be enabled to prey undisturbed on its model.

It is a curious coincidence that, in both the larva and the spider, it is the posterior end that mimics the head of the ant—a coincidence which possibly has its meaning.

iii. **Mimic.** *Pharuda limbata* (Wllngrn.). Plate XXIII. fig. 3.

**Model.** *Serinettha abdominalis* (Fab.). Plate XXIII. fig. 2.

The head, thorax, and coriaceous part of the elytra are, in this Hemipteron, of a bright vermilion-red, whilst the membranous part of the elytra, the legs, and antennæ are black. The moth has the head, thorax, costal margin, and basal half of the fore wings also vermilion, with the remaining portion black, the hind wings are coloured in the same way. I had long been familiar with the moth from cabinet specimens, but until I went to Singapore and saw the insect alive I had not suspected the significance of this very striking coloration. When the moth is in a state of repose, resting, for example, on a plant-stem, the wings are laid back and overlap in the characteristic moth-like manner, and in this attitude the resemblance to the bug is very striking (compare figs. 3 & 2, Plate XXIII.). The hind wings, although entirely hidden, nevertheless serve the purpose of giving an impression of complete opacity to the fore wings, the red and black areas of which in this attitude overlap the similar areas of

TABLE IV.—*The Pseudoposematic and Synaposematic Species of Bornean Lepidoptera.*

Models.	Mimics.				
	Subfam. <i>Nymphalinae</i> [? pseudoposematic].	Subfam. <i>Elymninae</i> [pseudoposematic].	Subfam. <i>Papilioninae</i> [chiefly pseudoposematic].	Subfam. <i>Pierinae</i> [synaposematic].	Subfam. <i>Chalcosinae</i> [synaposematic].
Subfam. <i>Danaeinae</i> .					
<i>Ideopsis daos</i> .....	.....	.....	<i>Papilio delesserti</i> ♀ .....	.....	{ <i>Isbarta pieridoides</i> (Herr-Schaff).
<i>Radena vulgaris</i> .....	<i>Euripus halitherses</i> ♂ ..	<i>Elymnias lais</i> ♂ .....	<i>Papilio megarus</i> .....	.....	
<i>Radena juvena</i> .....	.....	.....	<i>Papilio delesserti</i> ♂ ..	.....	
<i>Limnas chrysippus</i> .....	<i>Hypolimnas misippus</i> ♀ ..	.....	<i>Pap. macareus macaristus</i> ..	<i>Nepheronia lutescens</i> ♀ ..	
<i>Tirumala septentrionis</i> ..	.....	.....	.....		
<i>Bahora aspasia</i> .....	.....	.....	.....		
<i>Cadaga larissa</i> .....	{ ..... .....	<i>Elymnias lais</i> ♂ ..	{ <i>P. paradoxus telesicles</i> ♀, var. <i>russus</i> , <i>P. paradoxus telesicles</i> ♀, var. <i>leucothoides</i> , <i>P. leucothoe ramacens</i> , .....	.....	<i>Isbarta macularia</i> ♀ ..
<i>Parantica eryx</i> .....		<i>Elymnias aroa</i> , n. sp.		.....	<i>Amesia hyala</i> , .....
<i>Tronga crameri</i> .....	<i>Hypolimnas anomala</i> ♂ ..	.....	<i>Pap. slateri lewitsoni</i> ..	.....	{ <i>Mimeoplaca tristis</i> (Jordan).
<i>Adigama scudderi</i> .....	.....	<i>Elymnias lutescens</i> ..	.....	.....	{ <i>Pompeon subcyanea</i> , <i>Callanlesia striata</i> ♂ ..
<i>Penoa zonata</i> .....	.....	.....	<i>Pap. paradoxus telesicles</i> ♂ ..	.....	<i>Callanlesia striata</i> ♀ ..
<i>Penoa menestriesi</i> .....	.....	<i>Elymnias borneensis</i> ..	<i>Pap. paradoxus telesicles</i> ♀ ..	.....	
<i>Trepsichrois multiter</i> ♂ ..	{ <i>Euripus halitherses</i> ♀, var. <i>cinnamomus</i> , <i>Hypolimnas anomala</i> ♀ .....	.....	.....	.....	
" " ♀ ..	.....	<i>Elymnias lais</i> ♀ .....	.....	.....	



the hind wings. Both mimic and model were taken in daytime in the Botanic Gardens, Singapore, and both were equally conspicuous; subsequently both species were found in Sarawak<sup>1</sup>.

The following species are discussed below:—

	Mimics.	Models.
Subfam. <i>Nymphalinae</i> .	<i>Symbrenthia hippoclus</i> with the mountain forms.	Yellow-and-black <i>Neptis</i> , e. g. <i>N. hordonia</i> , <i>N. tiga</i> &c.
	<i>S. hypatia</i> var. <i>hippocrene</i> and <i>S. hypselis</i> var. <i>balunda</i> .	
	<i>Athyma</i> spp. ....	White-and-black <i>Neptis</i> .
Fam. LYCÆNIDÆ.	<i>Thrix gama</i> .....	<i>Eorylides tharis</i> .
	<i>Poritia plateni</i> .....	<i>Drupadia boisduvalii</i> var. <i>atra</i> .
	<i>Araotes lapithis</i> .....	<i>Biduanda thesmia</i> .

#### NOTES ON TABLE IV.

The females of *Euripus halitherses* (D. & H.) are extremely variable, in fact no two specimens of the fine series of this species in the Sarawak Museum collection are exactly alike, and almost every specimen deserves a varietal name of its own, as has been done to a certain extent for the mimetic *Papilio paradoxus telesicles* (Feld.) by Rothschild & Jordan (Nov. Zool. vol. ii.).

It is possible, however, to distinguish three main groups. One, almost entirely dark blue, is a mimic of *Trepsichrois mulciber* (Cr.), and approximates to *E. cinnamomeus* (Wood-Mason). Another is dark brown with a blue gloss and an oblique discal white fascia on the fore wings and some white streaks on the hind wings, and is a close mimic of *Danisepe lowei* (Butl.) ♂; this group is nearest to *E. pfeifferæ* (Feld.). The third group, near *E. euploeoides* (Feld.), corresponds closely in coloration and markings with *Danisepe lowei* ♀. A considerable number of variations of this highly variable species have been separated into distinct species, but I prefer to regard these as merely varietal names.

The females of *Danisepe rhadamanthus* (Fab.) (the continental form of *Danisepe lowei*) have much more white on the upper side and are readily distinguishable from the Bornean representatives, though the males are practically indistinguishable. In accordance with this, the continental forms of *Euripus halitherses* ♀ of the *euploeoides* type have larger white markings on the upper side than the insular forms; I have not seen continental forms of *Isbarta rhadamanthus* (Fab.) or of *Papilio caunus* (Westw.), but I expect that a parallel variation will be found in these. It is curious that the almost identical males of *D. rhadamanthus* and *D. lowei* are extremely common in their respective localities, whilst, on the other hand, the female of *D. lowei* is very rare, and the very different female of *D. rhadamanthus* is as common as its male.

*Hypolimnas anomala* (Wall.) is very Euploëine in its flight as well as in appearance; it is not an uncommon species and the

<sup>1</sup> [A closely similar example of Müllerian mimicry was sent for exhibition to the Entomological Society in 1894 by Mr. G. A. J. Rothney (see Proc. Ent. Soc. Lond. 1894, p. xv). The species *Phaуда flammans* (Walk.) and *Serinettha augur* (Fab.) were observed in abundance on roots and trunks of trees in Mysore in Nov. 1893 by Mr. Rothney.—E. B. P.]



resemblance is possibly synaposematic. There are, at any rate, some good grounds for supposing that *H. misippus* (L.) is a Müllerian mimic of *Limnas chrysippus* (L.). (See Poulton: "Mimicry in Butterflies of the Genus *Hypolimnas*," Proc. Am. Assoc. Adv. Sci. 1897, vol. xlv. p. 242.)

*Elymnias nigrescens* (Butl.) and allied species are in India and elsewhere mimics of *Euploeinae*; no *Euploeinae* serving as models to *E. nigrescens* occur in Borneo, though the species is common enough. The subfamily *Elymniinae* is an interesting one, as affording examples of species endowed with a double means of protection against the attacks of their enemies. The majority of the Bornean species are on the upper side good mimics of *Euploeinae* or *Pierine* models, whilst on the under side they are mottled with grey and brown, so that when at rest they are indistinguishable from their surroundings.

*Elymnias lais* (Cr.) occurred on Mt. Penrissen, and I had ample opportunities of observing something of its habits. The male is black above with green streaks, a common type of coloration amongst the *Danainae* (e. g., *Radena vulgaris* (Butl.), *Caduga larissa* (Feld.), *Parantica eryx* (Fab.), &c., &c.), whilst the under side is mottled. The female is a mimic of *Trepsichrois mulciber* (Cr.) ♀, but I have never seen this sex alive. The green-and-black *Danaines* *Caduga larissa* (Feld.) and *Parantica crowleyi* (Jenner Weir) were abundant on Mt. Penrissen, so much so, indeed, that after two days' collecting they were left in peace. Their flight was leisurely and flaunting, so that they were always readily distinguishable. Their mimic, the *Elymnias*, flew more rapidly, but even then attracted one's attention as being remarkably similar to its models. By the time one had realized the true nature of the insect, it had flown past and a critical moment was gone. If the butterfly was followed up, it would be seen to settle on some twig or stalk with the wings closed, but on coming up to close quarters one might search for it in vain; any sudden movement would cause it to dart away, displaying once again its *Danaine* coloration, to some other resting-place, and so the hunt would be continued *ad nauseam*.

*Elymnias godferyi* (Dist.) mimics *Delias aglaia* (Linn.), and has on the under side some appropriate yellow and red markings, which are, however, somewhat obscured by mottlings of brown. We have here, in fact, a species which is beginning to discard a uniform mottled under side in favour of brighter mimetic coloration, such as is seen in some species from New Guinea and the neighbouring islands, which mimic very closely on both surfaces of the wings *Euploeinae* and *Pierine* butterflies, and have discarded entirely a protective coloration.

*Elymnias aroa*, sp. n., is described in Appendix I. to this paper: only two specimens were captured. It is a fairly good mimic of *Tronga crameri* (Lucas), which occurred with it.

The common day-flying moths the Agaristid *Scrobiger a hesperioides* (Wlk.) and the Chalcosid *Eterusia obliquiaria* (Wlk.) are

closely similar in wing pattern and colour (compare figs. 7 & 8, Plate XXI.); their coloration recalls that of *Heliconius clysonymus* (Latr.) and *H. ricini* (L.) of S. America and of the common Oriental *Cethosia hypsea*.

[The majority of the Chalcosid synaposemes named in Table IV. are shown on Plate XXI., together with their Euplœine, Pierine, and Agaristid models. The resemblance to the *Pierine* is so much more striking and the patterns so much more detailed and varied on the under sides of the wings, that this aspect is alone represented in the case of both Pierine models and their Müllerian mimics (figs. 1 to 6, Plate XXI.). *Delias cathara* (Grose-Smith) is very rare, whilst its mimic *Callamesia pieridoides* (Wlk.) (compare figs. 5 & 6) is comparatively common, a fact which supports the Müllerian interpretation. A comparison of the whole series of Chalcosid mimics and their models leaves no doubt that the moth is the mimic and the butterfly the model, even though the former be common and the latter rare.—E. B. P.]

The species of *Symbrenthia* and of *Athyma* have a close resemblance to the Neptides, all of which are highly distasteful. The association in this case is probably Müllerian.

The extremely common Lycenidæ *Ecoylides tharis*, *Drupadia boisduvalii*, and *Biduanda thesmia* are mimicked by *Thrix gama*, by *Araotes lapithis*, and by *Poritia plateni*. In this case the mimicry is Batesian. Mr. de Nicéville, in his 'Butterflies of India,' vol. iii. p. 11, gives a list of mimetic Lycenidæ compiled by Doherty, but he informs me that Doherty conducted no experiments to prove the correctness of his association of the various species in mimetic examples. I am, however, quite certain that *E. tharis*, *D. boisduvalii*, and *B. thesmia* are distasteful species, whilst the great rarity of the mimicking species points to the conclusion that they are Batesian mimics.

## V. DIPTERA AS MIMICS.

A complete list of the mimetic flies of Borneo would comprise at least one-third of the total number of species, but inasmuch as the literature on the Malayan Diptera and their Hymenopterous models is both scanty and scattered, I think it advisable to postpone the compilation and discussion of such a list until our knowledge of these two orders as represented in the East is increased and more systematized. I therefore select for special notice and description eight species only, each of which exhibits some noteworthy modifications of structure and habit, produced in the attainment of a likeness to its respective mimic.

- i. **Mimic.** *Laphria* sp. near *terminalis* (v. d. Wulp). Plate XXII. fig. 10.

**Model.** *Salix sericosoma* (Smith). Plate XXII. fig. 9.

This large and handsome fly is not infrequently met with in the neighbourhood of Kuching, and the immunity which it

enjoys is doubtless due to the closeness of its resemblance to an equally conspicuous *Salix*, an ally of which has already been noted as the model of a Longicorn beetle. The fore wing of the *Laphria* is large, almost as broad as both fore and hind wing together of the *Salix* and of the same clear golden-brown. The thorax, as in the wasp, is covered dorsally with a golden pubescence, whilst the abdomen, like that of the model, is black, and terminates in a sharp tufted point very suggestive of a sting. All the tibiae and tarsi are ochreous, but the black and thickened femora are very unlike those of the *Salix*. No attempt at mimicking the long ochreous antennae of the wasp is made, as in some other Diptera shortly to be described (compare figs. 9 & 10, Plate XXII.). The buzzing, noisy flight of this fly is very like that of its model.

[In the natural attitude of rest it is probable that the black femora of the fly are held upright and near to the body, so that the ochreous parts of the legs would alone be conspicuous. It is noteworthy that the *under sides* of the anterior femora are ochreous, suggesting that the anterior limbs may in certain attitudes be raised, or, at any rate, that they are held so that this part is more conspicuous than any other femoral surface. It is probable that this special colouring is directed to meet a view from the front. It is to be hoped that future observations will be specially directed to these points. This fly belongs to the family of the Asilidae (subfamily *Laphrine*), the most formidable and predaceous of Diptera, and it is quite possible that the resemblance to a wasp is Müllerian (synaposematic) rather than Batesian (pseudaposematic).—E. B. P.]

ii. **Mimic.** *Hyperichia fera* (v. d. Wulp). Plate XXII. fig. 2.

**Model.** *Xylocopa latipes* (Drury). Plate XXII. fig. 1.

No more remarkable proof of the plasticity of the Dipterous form could be advanced than this remarkable insect. The large, clumsy *Xylocopa*, with its bronzy wings and thick furry legs, would seem to be an eminently unsuitable and difficult model to copy; and it would be most instructive, if only it were possible, to trace the steps by which this fly has arrived at what at first sight appears to be the pitch of mimetic perfection. As a matter of fact the fly is extremely rare, and one can only conclude that the mimicry, exact though it seems, has failed to preserve the species as a dominant one.

The head is characteristically Dipterous; the thorax is of shining blue-black, clothed with a fine dense pubescence, coarser and longer on the sides; the broad, flattened abdomen is laterally bordered with a fringe of long hairs exactly as is the case with the *Xylocopa*, and terminates in a fine tufted process suggesting a sting. As in *X. latipes*, all the legs are remarkably hairy and sturdy, particularly the last pair, and are of much the same length. The wings are of a bluish-bronze hue: the downwardly-

curved submedian vein in the wing of the fly represents the junction between the fore and hind wings of the bee, and the areolet of the hind-wing of the bee also finds its parallel in the alula of the fly. The halteres are quite concealed amongst the hairs on the sides of the thorax. I have only seen one solitary specimen of this fly (Kuching, Feb. 1899), and have nothing to record of its habits beyond stating that both on the wing and at rest it was exceedingly difficult to distinguish from the common *X. latipes* (compare figs. 1 & 2, Plate XXII.).

[It is possible that the fly is constantly mistaken for a *Xylocopid*, and that it is not nearly so rare as it appears to be. The genus is widespread, and Mr. G. A. K. Marshall has sent me an equally beautiful example from Mashonaland. In this case the insect is unique (it has been recently described as *Hyperechia marshalli* (Austen)), but Mr. Marshall's notes clearly indicate the reason of its rarity. It must be remembered also that the extreme perfection of the resemblance is aided by the rapid flight and alertness of the fly. *Hyperechia* belongs to the same family and subfamily as the species last described, and here, too, the Müllerian interpretation must be taken into account. In fact Mr. Roland Trimen, to whom I showed the African specimen, expressed the opinion, from his experience of its allies, that it is a far more formidable insect than its model. The strengthening and curvature of the submedian vein in the fly's wing, which apparently represents the junction between the bee's fore and hind wings, is an instance of the attainment of a detail in the resemblance by a very slight alteration of form; for the vein in the last-described species of fly pursues nearly the same curved direction, although the line of junction of the wings of its model is nearly straight. In both species of fly there is a slight break in the even contour of the margin at the point where this vein reaches it, which is very suggestive of a junction between fore and hind wings, while the curve of the margin is changed on either side of the break in such a manner as further to promote the resemblance.—E. B. P.]

iii. **Mimic.** *Milesia vespoides* (Wlk.). Plate XXII. fig. 14.

**Model.** *Vespa cineta* (Fab.). Plate XXII. fig. 13.

The large wasp, black with a broad red band on the second abdominal segment, is closely mimicked by an equally large fly with the distal half of the second segment and the proximal half of the third segment coloured red. This red band, though actually occupying a different position from that of the wasp, is separated from the thorax by a black interspace nearly equal in breadth to the wasp's first abdominal segment, which is also black. The wings are similarly coloured in both species (compare figs. 13 & 14, Plate XXII.).

iv. **Mimic.** *Midas*, n. sp. (Fam. Midaidæ.) Plate XXII. fig. 12.

**Model.** *Macromeris violacea* (Lep.). Plate XXII. fig. 11.

*Macromeris violacea*, a dark blue fossorial wasp, with dark blue



wings resplendent with metallic blue sheen, occurs commonly on the mountains near Kuching. On Mt. Santubong a fly was recently captured affording a close resemblance to the wasp. The body and legs are exactly of the same shade of colour as are those of the wasp; the wings, though somewhat browner, are more opaque and possess a blue metallic sheen sufficiently deceptive. Their size is large (larger than the fore wing alone of the wasp), and it is interesting to note the same downward curve of the submedian vein as was found in *Hyperechia fera*, suggesting the line of junction between a fore and a hind wing. The antennæ are fairly long, though far shorter than those of the wasp. I have not seen this species in the living state, but even as a cabinet specimen it is a remarkable case of deceptive resemblance (compare figs. 11 & 12, Plate XXII.).

Specimens of this fly from the Philippines and Tenasserim are in the British Museum collection of Diptera.

v. **Mimic.** *Physocephala* sp. (Fam. Conopidæ.)

**Model.** *Ischnogaster micans* (Sauss.).

This example has been selected at hazard from a large number of similar thin-waisted flies, chiefly Syrphidæ and Conopidæ, as typical of the method by which the similarly built Eumenidæ and Vespidæ are mimicked. The first abdominal segment is much attenuated and drawn out, those following are thickened; the transparent wings are shaded with fuscous on their anterior borders, in accordance with a similar arrangement in the wasp; the head is the only part which exhibits any of the yellow colouring of the model.

vi. **Mimic.** Gen. et sp. ? (Fam. Stratiomyidæ, subfam. *Raphiocerinae*.) Plate XXII. fig. 6.

**Model.** *Mesostenus* sp. near *pictus* (Smith). Plate XXII. fig. 5.

Both species were taken on Mt. Penrissen on the same day, and the similarity of their external appearance was equalled by the similarity of their method of flight and action when at rest. The Ichneumon-fly was common enough, and was frequently seen to hover over a plant for a few minutes, then suddenly drop down and pitch on to a leaf, over which it would walk, moving its white-banded antennæ up and down with a quick flickering movement. The fly, of which only one specimen was caught, behaved in exactly the same manner; it would hover, then suddenly settle and walk over a leaf on its mid and hind pairs of legs, waving rapidly up and down its long front legs, the tibiæ of which being black and the tarsi white, most closely resembled the antennæ of the Ichneumon-fly. The femora were kept more or less pressed against the ventral surface of the head, so that the sham antennæ seemed actually to arise from the correct position. This method of bringing about a resemblance to long antennæ is



also made use of by several species of *Calobata* and allied genera, but in the case here described the mimicry of an Ichneumon-fly is carried still further, inasmuch as the coloration is almost identical in both species, viz., black with yellow spots on the head and thorax, with alternate yellow bands on the abdomen, while the legs are ochreous with a black band at the apex of the femora and tibiæ. Furthermore, the ample clear wings are very similar in both mimic and model (compare figs. 5 & 6, Plate XXII.). The nearest allies of this remarkable fly occur in S. America.

vii. **Mimic.** ? *Xylophagus* sp. (Fam. Leptidæ.) Plate XXII. fig. 8.

**Model.** *Mesostenus* sp. Plate XXII. fig. 7.

This example is remarkable for the great elongation of the antennæ of the fly. In the previous case it was seen that the long antennæ of the model were represented by the fore legs of the mimic, but here there is an actual copy produced by means of a very unusual modification amongst the Diptera. The mimicry is so perfect that it will almost bear a close scrutiny through a lens; the large eyes, prominent clypeus, and maxillary palps of the fly give the head, even when thus closely examined, a characteristic Hymenopterous appearance. For the rest, the coloration is almost identical in both species: black with yellow spots and bands (compare figs. 7 & 8, Plate XXII.). The larvæ of the fly was found in decayed wood and presented no very extraordinary features.

viii. **Mimic.** *Sepedon* sp. near *javanicus* (Desv.). (Fam. Scio-myzidæ.) Plate XXII. fig. 4.

**Model.** *Collyris emarginata* (Mael.). Plate XXII. fig. 3.

It is not usual to find amongst the Diptera species which mimic any other order of insects than the Hymenoptera. This example and a species of *Celyphus*, which only very doubtfully can be considered as mimicking a small bug, are the only cases known to me.

Both of the species now under discussion were caught together on the wing on Mt. Serambu, Sarawak, and when seen alive and actively moving about were not readily distinguishable. As cabinet specimens they furnish an instance of the importance of field-work in the study of mimicry, and of the unreliability of dead impaled insects or mere figures unless, indeed, both are prepared with reference to careful observations of the living forms. The fly when alive was of a very brilliant blue like that of the *Collyris*, but the colour has now faded to a dusky indigo, while the abdomen being much shrunk detracts considerably from the previous resemblance. The legs are brilliant red, and constituted one of the most conspicuous features of both fly and beetle (compare figs. 3 & 4, Plate XXII.).

## VI. RHYNCHOTA AS MIMICS.

*α. Rhynchota Hemiptera.*

i. **Mimic.** *A. Reduviid*, sp.

**Model.** *Bracon*, sp.

The bug has the elytra, wings, and dorsal surface of the body reddish ochraceous as in certain common *Braconidæ*; the abdomen beneath is white; the apex of the coriaceous part of the elytra is black, thus resembling the black stigma on the fore wing of the model; while both elytra and wings are suffused with fuscous as in the model. So perfect is the resemblance between the two species that the bug was placed in a cabinet together with several other Hymenoptera, and the mistake was only discovered quite recently whilst attempting to arrange the museum collection of *Braconidæ*.

Another species, probably of the same genus of bug, mimics another similarly coloured species of *Bracon* in the same manner as above described.

[See also under section *Convergent Groups* for other examples of mimetic Hemiptera.]

*β. Rhynchota Homoptera.*

ii. **Mimic.** *Issus bruchoides* (Wlk.). Plate XIX. fig. 10.

**Model.** *Alcides*, sp. (*Curculionidæ*.) Plate XIX. fig. 9.

This remarkable little Homopteron, one example only of which is in the British Museum from Sumatra, occurs not uncommonly at Kuching on fallen logs or on living wood, whilst the Weevil is frequently found beneath the bark of fallen logs, sometimes in the very logs on the surface of which is found the mimic.

The whole appearance of the mimic with its hard convex elytra and deceptively powerful legs is very weevil-like, and the resemblance was evidently noted by the describer. The fore legs are much flattened and in side-view correspond closely in appearance to the powerful fore legs of the *Alcides* (compare figs. 9 & 10, Plate XIX.).

VII. SPIDERS<sup>1</sup> AS MIMICS.

i. **Mimic.** *Cyrtarachne conica* (O. Pickard-Cambridge).

**Model.** *A mollusc*.

The abdomen of this Spider is many times larger than the cephalothorax and is dorsally produced into a cone, which appears as if tilted backwards. The colour of the abdomen is creamy or yellowish white, marked with fine black and greenish lines and mottlings, arranged in a somewhat concentric manner so as to

<sup>1</sup> The Spiders here noted were described in P. Z. S. 1901, i. p. 11 *et seq.* pl. v. *Cyrtarachne conica* was wrongly recorded as occurring in Singapore.

represent very closely the whorls of a spirally coiled snail-shell, such as *Helix*.

The spider occurs in Kuching, and is generally found resting on leaves, sometimes with the cephalothorax turned right under the abdomen, in which position it is readily mistaken for a snail-shell, or with the cephalothorax in the normal position. In the latter case, if disturbed, this part of the body is immediately doubled under the abdomen and the animal usually rolls off the leaf, especially if a small one, and becomes lost in the decaying vegetation carpeting the ground below. I have been unable to discover any web, nor have I seen the manner in which the animal hunts or seizes its prey, but it seems probable that this is an example of one of those doubly significant devices whereby an animal is enabled not only to avoid its foes (in this case predatory wasps) but also to approach its own prey unobserved.

[It is possible that this resemblance is cryptic rather than mimetic. The former interpretation seems to be valid in the case of the British larva *Aspilates gilvaria*, which also resembles a snail-shell.—E. B. P.]

ii. **Mimic.** *Amycia lineatipes* (Pickard-Cambridge).

**Model.** *Ecophylla smaragdina* (Fab.).

I am indebted to Mr. H. N. Ridley for leave to incorporate in this paper the observations which he has made on this mimetic species, which as yet I have failed to find in Borneo. The ant under notice is an extremely common and ferocious species, chiefly remarkable for its nest-building habits. Mr. Ridley has described these habits in the Journal of the Asiatic Society, Straits Branch, 1890, No. 22, p. 345. The spider is of the same colour as the ant (reddish brown), and bears on the posterior part of the rather acutely pointed abdomen a pair of black eye-like spots, so that it is the abdomen of the spider which corresponds to the head, the cephalothorax to the abdomen of the ant. Both mimic and model are found together near the nest of the latter, and so close is the resemblance between the two that the spider is able to prey with impunity on the ants: I have taken a specimen of a spider with the body of an ant sucked nearly dry in its jaws; and Mr. Ridley has seen an individual pounce on an ant and then dropping from its foot-hold on a leaf, hang suspended by a silk thread in order to complete its meal in safety. No web is spun by the spider, but a round disc of silk, probably the egg-cocoon of this species, was found on the under surface of a leaf much frequented by the spider and its models.

iii. **Mimic.** *Salticus attenuatus* (Pickard-Cambridge).

**Model.** *An Ant*.

Mr. Ridley also sent me from Singapore a remarkable little Attid with a well-marked constriction about the middle of the

cephalothorax and a slender abdominal peduncle, so that the triple division of the insect-body is well imitated. The abdominal peduncle appears to bear a small scale and the abdomen is elongated; the elbowed antennæ of an ant are mimicked by the anterior pair of legs of the spider. I have not been informed whether this species, like the preceding, lives in company with its models.

### VIII. CONVERGENT GROUPS.

There are certain combinations of colours in distasteful or otherwise specially protected insects which may be considered as warning: such are, black with yellow bands, black with one broad red band, black with white tips to the wings, yellow or red with black spots, red elytra or wings more or less broadly tipped with black; and we find insects, belonging to the most diverse orders, with one or other of these combinations of colours converging to a central form, a typical distasteful insect. Some of these converging forms may be non-immune and pseudaposematic (examples of Batesian mimicry); others may be distasteful themselves and synaposematic (examples of Müllerian mimicry). For example, all the Lycidæ are strongly distasteful, as I have proved by repeated experiments<sup>1</sup>, and large numbers of them show the same type of coloration, the anterior third or two-thirds of the elytra being red, the posterior two-thirds or third black, whilst the head and thorax are black or red. Resembling the members of this group are ten species of Longicorns, belonging to four subfamilies, one Clerid, two Hispids, two Elaters, one Rhipidocerid, one Eucnemid, or seventeen Coleoptera in all, one moth and several Hemiptera. The Lycidæ, then, may be considered as distasteful insects which are characterized by a definite type of warning coloration, whilst the coloration of the insects which resemble them so closely can hardly be looked on as essentially typical of the groups to which the insects belong. The conspicuous Lycid, *Lycostomus gestroi* ♀, is mimicked by three Longicorns—*Erythrurus apiculatus* var., *E. rotundicollis* and *sternalis*, and by *Eurycephalus lundii*, by a moth, *Phauda limbata*, by at least four bugs, of which *Ectatops rubiaceus* and *Serinetha abdominalis* alone have been identified.

The arrangement of colours in the Lycid *Metriorrhynchus kirschi*, in the Longicorns *Ephies dilaticornis* and *Erythrurus biapicatus*, in the Hispid *Gonophora wallacei* var., and in a Clerid of the genus *Tenerus* (*T. sulcipennis* (Gahan)) is almost identical. *Calochromus dispar* is mimicked by the Longicorns *Pyrestes eximius* and *P. virgata*, by a Rhipidocerid of the genus *Ennomates*, and by an unidentified Eucnemid. The Lycids *Ditoneces* sp. near *fuscicornis* and *Taphes brevicollis*, the Lamiid Longicorn *Xyaste torrida*,

<sup>1</sup> A strong vitality is correlated with this distastefulness; I have seen a Lycid beetle walk away apparently uninjured after it had been well pecked by two or three fowls. The distasteful Endomychidæ are also difficult to kill (cf. also vitality of *Danaïne*, *Aeræinæ*, and *Heliconinæ* noted by various authors).



and the Hispid *Gonophora wallacei* are much alike in their general appearance; and so too are the Lycids *Cautires excellens* and *Metriorrhynchus acutangulus*, the Elaters *Agonischius pectoralis* and *A. (?) sanguineipennis*, the Longicorns *Xyaste fumosa* and *X. invida*, and a Reduviid bug.

The association of these species in one convergent group is represented in a diagrammatic way in Table V. (p. 269): the species other than Lycidæ which I consider to be distasteful are indicated by an asterisk, but it is not improbable that others may hereafter be proved to be Müllerian rather than Batesian mimics.

[The prevalent types of Lycid coloration are very simple, being uniform red or ochreous or one of these colours combined with black. The same patterns have an immense range corresponding with the wide distribution of the family over the warmer parts of the world. Hence this beautiful group of Bornean insects of many orders which adopt a colouring characteristic of the Lycidæ could no doubt be paralleled in many countries. Examples of Lycoid American moths belonging to distasteful groups are given in Journ. Linn. Soc. (Zool.) vol. xxvi. p. 569. Mr. G. A. K. Marshall has sent me a wonderful group belonging to this type, the ground-colour being ochreous, from Salisbury, Rhodesia. The central type is provided by seven species of Lycidæ, and it is resembled by a Telephorid, a Melyrid, two Phytophaga, three Cantharidæ, three Longicorns, many species of Hymenoptera Aculeata, several Hemiptera, a fly (*Xiphocerus*), a Zygenid moth, and an Arctiid Moth. This group is briefly mentioned in the Report of the British Association (Section D), Bradford Meeting, 1900, p. 793.—E. B. P.]

A second group may be formed out of Coccinellid-like insects. All the well-known Coccinellidæ with red or yellow elytra spotted with black are the central figures of the group, with perhaps an excessively common Cassid, *Prioptera octopunctata*; mimicking these are a Longicorn, *Entelopes glauca* (Pasc.), two species of *Lema* and a *Curculio*, the remarkable new Locustid of a genus near *Gammarotettix*, a Pentatomid bug of the subfam. *Asopinæ*, *Blachia ducalis* (Wlk.), and a spider with large red abdomen spotted with black. The association is indicated diagrammatically in Table VI. (p. 270); the mimics of Coccinellidæ, which are believed to be Müllerian, are indicated by asterisks. Nearly the whole of the species here mentioned are figured on Plate XXIII. figs. 30 to 36. The *Lema* figured (*L. quadripunctata*) is a less perfect mimic than *L. femorata*.

The little Dammar-bee *Melipona vidua* (Lep.), black with white-tipped wings, is an extremely common insect in Borneo, and, though stingless, is protected by its ferocious biting and social habits<sup>1</sup>.

<sup>1</sup> A certain tree in the jungle near the Sarawak Museum was known to harbour a nest of this species; when the bees swarmed it was impossible to approach the tree without attracting a large number which settled on one's hair and face and bit so fiercely that a hasty retreat had to be made. A tame monkey, secured by a chain and sliding ring to a bamboo pole which contained a nest of another species of *Melipona*, refused after two attempts to scale the pole when the bees were swarming round the mouth of the nest.

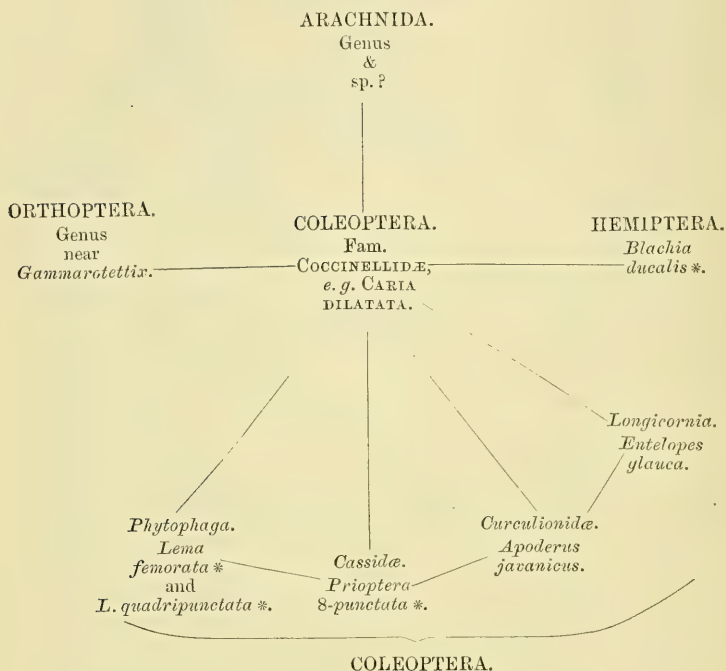




## TABLE VI.

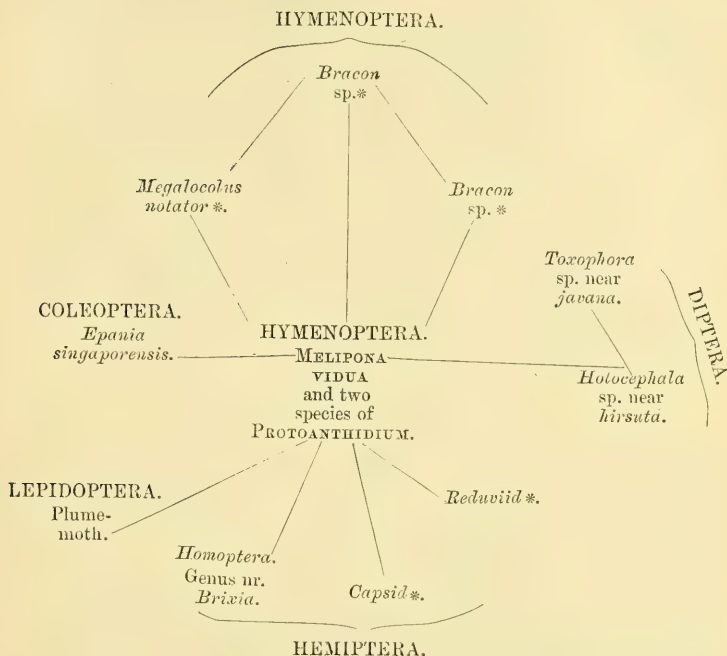
## Convergent Group 2.

(Coccinellid pattern.)



There are two species of *Protoanthidium* coloured in the same way; and there is a large concourse of insects of different orders mimicking this type of coloration, viz.: four Hymenoptera; three species of *Bracon*, one with very hairy hind femora and tibiæ simulating the dilated tibiæ of its model, and a Chalcid, *Megalocolus notator* (Walk.); a Longicorn, *Epania singaporensis* (Pasc.); a plume moth; a Capsid, a Reduviid, and an obscure Homopterous insect; two flies, *Holocephala* near *hirsuta* (v. d. Wulp), and *Toxophora* near *javana* (Wied.). The resemblances between these mimics and the *Melipona* are in some cases remarkably exact; the Longicorn and the *Holocephala* were taken in the company of the bees; all the mimicking Hymenoptera are indistinguishable from their model whilst on the wing. In this group I consider the *Melipona* to be the central typical warningly coloured and specially protected insect. Asterisks indicate the convergent species which are probably synaposematic in the following diagrammatic arrangement represented in Table VII. (p. 271). The whole of the species are shown in Plate XXIII. figs. 37 to 47.

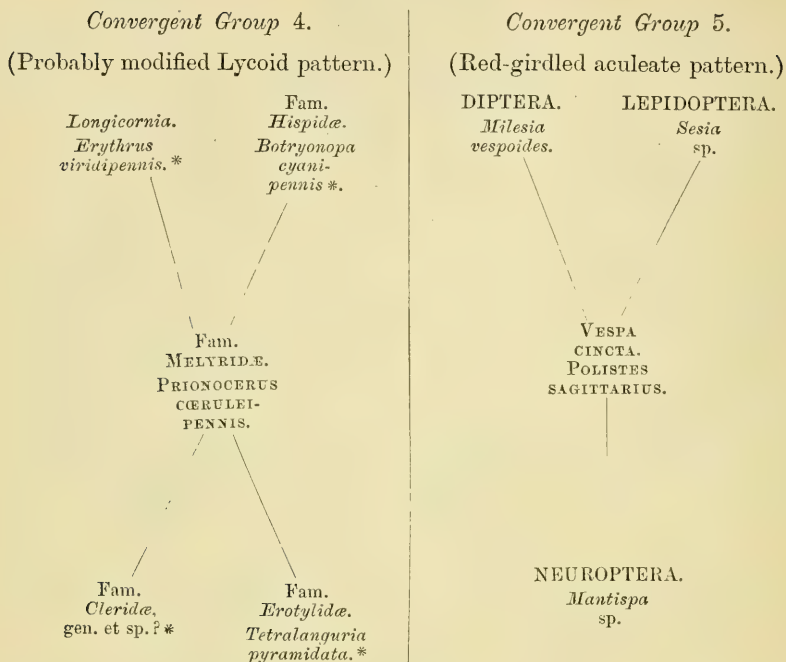
TABLE VII.

*Convergent Group 3.**(Melipona-like pattern.)*

A fourth group is characterized by the following combination of colours: black head, red thorax, and iridescent green elytra. This type of coloration is well illustrated by a Melyrid, *Prionocerus cæruleipennis* (Perty), a Longicorn, *Erythrus viridipennis* (Gahan), an Erotylid, a Hispid, *Botryonopa cyanipennis* (Baly), and a Clerid. It is probable that the whole of these species are synaposematic, as is indicated in the accompanying Table VIII. Group 4 (p. 272). Four of the species are represented on Plate XXIII. figs. 58 to 61.

A fifth group has a broad red band across the middle of the abdomen; into this will fall two common wasps, *Vespa cincta* and *Polistes sagittarius*, and their mimics, a Sesiid moth, a fly, and a Mantispæ. There is at present no reason for considering any of the convergent species shown in Table VIII. Group 5 as other than pseudaposematic. The *Mantispa* and *Polistes* are shown in figs. 27 & 26 on Plate XIX., the *Vespa* and *Milesia* on figs. 13 & 14 on Plate XXII.

TABLE VIII.



There is a considerable assemblage of uniformly-coloured ochreous species of Phytophaga of the families Halticidæ, Galerucidæ, etc., and of mimicking Longicorns of the subfamilies *Saperdinae* and *Astatheinae*; these, however, are not included in the table, as sufficient examples have been given clearly to illustrate the wide distribution of a characteristic type of warning coloration.

## APPENDIX I.

### 1. LEPIDOPTERA RHOPALOCERA, by R. SHELFORD.

#### ELYMNIA AROA, sp. n.

♂. Dark fuscous brown, with the following cream-white markings:—*Upper side: fore wing*, a submarginal series of spots commencing from below the discoidal nervule, the last one double; some indistinct notching at the external angle; the external margin is somewhat irregularly scalloped: *hind wing*, a sub-discal series of internervular spots and dashes, one of each to each interspace, the last interspace but one carrying a double

set, the last a single streak; a series of large submarginal spots, the last of which fuses with the above-mentioned streak, the others partially or completely distinct; some marginal irregular mottlings. Wing rather deeply scalloped and subcaudate. *Under side* pale fuscous; *fore wing*, costal area black barred with white, some basal white mottlings, submarginal spots more distinct than on the upper side; *hind wing*, some basal white spots, one below the first subcostal nervule, another just below the cell, the subdiscal series very indistinct, the submarginal series of large spots distinct, a marginal mottled band of transverse streaks far more pronounced than on the upper side, inner margin blackish barred with white. Cilia white and fuscous alternately. Expanse 80 mm.

♀. *Upper side* paler fuscous, markings as in the male; *under side* as in the male but the markings more diffuse. Expanse 93 mm.

*Hab.* Mt. Penrissen, Sarawak.

Types in the Sarawak Museum.

The nearest ally of the species appears to be *E. lutescens* (Butl.).

## 2. COLEOPTERA LONGICORNIA, by C. J. GAHAN.

### ZELOTA, gen. nov. (*Mesosinarum*).

Head deeply concave between the divergent antenniferous tubers; front slightly convex, narrowed between the eyes; genæ long and somewhat swollen; eyes divided, rather finely faceted. Antennæ of the male scarcely longer than the body; scape stout, subclavate, furnished at its apex with a short spine behind and a narrow cicatrix in front, the latter completely bounded by a projecting rim; third joint slender, slightly curved, nearly twice as long as the first or fourth, armed at the apex with a sharp spine; 5th to 11th joints very short, together scarcely longer than the 4th; last five or six joints thickly fringed with long hairs underneath, the remaining joints being sparsely ciliate. Prothorax transverse, rounded and unarmed at the sides. Mesonotum without stridulating area, arcuately emarginate in front. Elytra but little longer than their conjoined width, prominent at the shoulders, broadly rounded at the apex; each furnished a little behind the base with a very prominent ridge, surmounted by a tuft of long hairs tapering to a point in imitation of a spine. Prosternum strongly arched, almost vertically sloped behind. Mesosternum short and horizontal behind, subvertical in front. Legs subequal in length; femora fusiform; middle tibiæ without notch on outer margin; claws of tarsi divergent.

This new genus comes near *Cacia* (Pasc.) in the group or subfamily *Mesosinæ*; and in the same section with it should be placed the genera *Planodes* (Newm.) and *Calymmophis* (Thoms.), which Lacordaire, on insufficient grounds, withdrew from the *Mesosinæ*, assigning them a place in his "groupe" *Monohammides*. The genus *Ereis* (Pasc.), which was treated by him in the same way, should also be restored to the *Mesosinæ*, finding a place near the genus *Mesosa*.



*ZELOTA SPATHOMELINA*, sp. n. (Plate XXIII. fig. 57.)

*Nigro-cyanea*; *capite fere nigro, in fronte subnitido, utrinque pone oculum inferiorem macula rufo-fulvescente notato; prothorace transverso, lateraliter rotundato, antice transversim sulcato, tenuissime griseo-pubescente; elytris sat dense punctulatis, nigro-cyaneis aut violaceis, utrisque maculis duabus aut tribus rufo-fulvis notatis—una communi paullo pone scutellum, secunda ad marginem externam paullo pone basin, tertia fere ad medium disci; pedibus nigro-cyaneis aut violaceis, sparse ciliatis; tibiis extus in medio albo-cinereis.*

*Long.* 7–8; *lat.*  $3\frac{1}{2}$ –4 mm.

*Hab.* Sarawak. 1 ♂ in Brit. Mus., 2 ♂♂ from Kuching, Sarawak (*R. Shelford*), in the Hope Museum, Oxford.

In the two ♂ specimens in the Hope Museum there is a small spot of reddish pubescence just under the anterior part of the lower lobe of each eye, in addition to the somewhat larger rounded spot of the same kind behind the lobe. In these specimens also the third reddish spot of each elytron—that placed a short distance behind the base of the large tufted tubercle, but a little more externally—is present and distinct, and there is a cinereous patch crossing the elytra a little in front of the apex.

## APPENDIX II.

*Descriptions of additional Species mentioned and figured in the accompanying paper.*

[Received January 5, 1903.]

### 1. LEPIDOPTERA HETEROCERA, by KARL JORDAN.

*MIMEUPLÆA TRISTIS*, sp. n. (Plate XXI. fig. 12, ♀.)

♂. Body olive-black, with a rather feeble greenish-blue gloss; under side white-spotted as in *M. rhadamantha*. Wings mummy-brown above and below, not distinctly metallic, except costal margin of fore wing below and a small dot at base of fore wing above. Fore wing, upper side: a series of broad creamy-white streaks from costal margin to  $SM^2$ , separated by the brown veins, the upper ones reaching from margin halfway to cell, the posterior ones shorter and not quite touching margin. A series of streaks also on hind wing, but here thin, submarginal. The streaks present on under side of both wings, broader than above, all reaching margin.

♀. Similar to ♂; streaks of fore wing vestigial and narrow above, the five posterior ones ending proximally in a small white spot, streak  $M^1$ – $M^2$  much longer than the two above and the one below it; streaks of under side of fore wing broader than above, but thinner than in male and much more clayish. No streaks on hind wing above, but vestiges of them present on underside. (Neuration of this specimen abnormal on right fore wing.)

Length of fore wing: ♂ 32, ♀ 36 mm.

*Hab.* North Borneo: ♂ from Sandakan, June 28, 1894 (D. Cator, in the Tring Museum); ♀ from Kuching, Oct. 1895 (Sarawak Museum, Kuching).

Neuration similar to that of *M. rhadamantha*.

## 2. COLEOPTERA LONGICORNIA, by C. J. GAHAN.

*ERYTHRUS ROTUNDICOLLIS*, sp. n. (Plate XXIII. fig. 6, ♂.)

*Niger, elytris a basi usque paullo pone medium rufis: antennis quam corpore a quarta parte brevioribus, articulis 5<sup>o</sup> ad 10<sup>um</sup> ad apicem antice dentatis; prothorace lateraliter rotundato, latitudine maximo ad medium, disco tuberculis duobus parvis nigro-pilosis vix ante medium positis instructo; elytris postice rotundatim attenuatis, utrisque ad suturam breviter dentatis.*

*Long.* 17; *lat.* 4 mm.

*Hab.* Mt. Santubong, 2600 ft., February 4, 1900. One male specimen.

Black, with rather more than the basal half of the elytra red. Antennæ about three-fourths the length of the body, with the joints from the fifth to the tenth produced into a tooth at the antero-distal angle. Prothorax rather strongly rounded at the sides and widest about the middle; the disk with two small velvety tubercles placed barely in front of the middle. Elytra slightly widening from the base up to about the posterior third or fourth, and thence narrowing towards the apex, where each ends in a small sutural spine; the disk of each with a rather feeble costa extending from the base to a little beyond the middle.

This species most resembles *E. atricollis* Pasc., but in the latter the dark apical area of the elytra is less extensive; the prothorax is less rounded, is widest behind the middle, and on the disk has but a single median cariniform tubercle.

*ERYTHRUS STERNALIS*, sp. n. (Plate XXIII. fig. 7, ♂.)

*Niger, elytris a basi usque pone medium rufis: prothoracis disco tuberculo mediano inter medium basinque, et utrinque tuberculo parvo paullo ante basin posito, instructo; elytris postice rotundatim attenuatis, utrisque ad suturam sat valde spinosis; prosterno inter coxas tuberculato, mesosterno postice minus fortiter tuberculato.*

*Long.* 20; *lat.* 4½ mm.

*Hab.* Mt. Matang, 3600 ft., June 1900. Two male specimens; in British Museum and Hope Collection, Oxford.

Black, with basal three-fifths of the elytra red. Antennæ about three-fourths the length of the body; fifth joint angulate, each of the succeeding joints up to the tenth strongly toothed in front at the apex. Prothorax strongly and thickly punctured, with a median cariniform tubercle between the middle and the base, and a small blunt tubercle on each side of the disk nearer to the base. Elytra rather strongly punctured; the disk of each with a well-marked costa reaching from the base to within about

one-fifth from the apex. Prosternum rather strongly tuberculate between the coxæ; the mesosternum with a smaller tubercle on its hinder half.

This is the only species of the genus known to me in which the sternal processes are distinctly tuberculate.

*ERYTHRUS BIAPICATUS*, sp. n. (Plate XXIII. fig. 19, ♀.)

*Niger, prothoracis disco et elytrorum basi rufis, nigro-vittatis: prothorace ruguloso-punctato, sine tuberculis distinctis; elytris dense granulatis, postice divaricatis, utrisque in spinam parvam terminantibus.*

*Long.*  $15\frac{1}{2}$ ; *lat.*  $3\frac{1}{2}$  mm.

*Hab.* Kuching, Mt. Matang, 3600 ft., June 1900. One female example.

Black, with the disk of the prothorax and the basal third of the elytra partly red, the red of the prothorax being interrupted by two black bands extending from the front margin, and by a small median spot near the base, while the red on the base of the elytra is divided by a narrow band along the suture, and two wider bands on each side extending forwards and gradually narrowing from the posterior black area. Prothorax rugulose punctate, and showing traces only of the tubercles present in most of the other species. Elytra very densely granulate, the granules bearing very minute black setæ, which are scarcely evident except on the rufous areas near the base. Metasternum somewhat similarly granulate to the elytra, and the abdomen much more finely so. Antennæ of the female about half the length of the body, with the joints from the fifth to the tenth rather broad, and angulate at the apex on the anterior side.

The divergence of the elytra from the suture behind and the granulation of their surface serve to distinguish this species from all those hitherto described belonging to the genus.

*ERYTHRUS VIRIDIPENNIS*, sp. n. (Plate XXIII. fig. 58.)

*Niger, prothorace toto rufo, elytris viridescentibus aut viridicyaneis et opacis; antennis (♂) quam corpore paullo brevioribus, (♀) medium elytrorum vix superantibus, articulis 5<sup>o</sup> ad 10<sup>um</sup> modice dilatatis ad apicem dentatis; prothorace obsolete punctato, supra leviter quadri-nodoso; elytris creberrime ruguloso-punctatis, apice subsinuatis ad suturam breviter spinosis.*

*Long.* 12-16; *lat.*  $2\frac{1}{2}$ -3 mm.

*Hab.* Mount Matang, near Kuching in Sarawak (3600 ft. alt.), June 1900. Five examples; in the British Museum and Hope Collection, Oxford.

Prothorax red above and below, elytra of a dull green or bluish-green colour, all the rest of the body together with the legs and antennæ being black. Prothorax indistinctly punctured, furnished with four feeble nodules on the disk, two being near the middle and two, more widely separated from each other, near

the base. Elytra very closely rugulose-punctate, gradually widening from the base backwards, broadly rounded and slightly sinuate at the apex, with a short spine on each at the suture.

*NOTHOPEUS INTERMEDIUS*, sp. n. (Plate XIX. fig. 21, ♂.)

*Corpore supra, capite toto, pedibus antennisque fulvis, his versus apicem infuscatis; thorace subtus et abdomine nigro-cyaneis, sed prosterno mesosternoque medio, maculis duabus metasterni et segmento primo abdominis fulvis, hoc argenteo-sericeo; elytris (quod attinet ad hoc genus) perelongatis, apicem abdominis fere attingentibus.*

*Long.* 27; *lat.* (pone humeros) 7 mm.

*Hab.* Sarawak, Mt. Penrissen, May 1899. One male example; in the Sarawak Museum, Kuching.

Head, antennæ (except the last four joints, which are brownish), disk of prothorax, and elytra tawny red; body underneath bluish black, but with the prosternum, mesosternum, a spot on each side of the metasternum, and the whole of the first abdominal segment tawny, the latter being covered with a silky pubescence giving silvery reflexions in certain lights. The elytra, though unusually long for this genus, extending nearly to the apex of the abdomen, are considerably narrowed from a little behind the shoulders, and each in its posterior half is scarcely half as broad as it is at the base. The hind tibiæ of the male are thickened and subcylindrical, narrowed towards the base and very slightly also towards the distal end.

This species comes nearest in structural characters to *Aphrodisium tibiale* Rits., from Assam, but differs from it in having the elytra still more attenuated behind and the front of the head narrower. Ritsema placed his species in *Aphrodisium* as an aberrant member of that genus; but considering the reduction in the size of the elytra and the peculiar form of the male hind tibiæ, I believe it to be better placed in *Nothopeus*, though undoubtedly showing strong affinities with *Aphrodisium*. His species and the one here described are both extremely interesting as showing the gradual progress of that modification leading to the very shortened elytra and the strongly mimetic forms characteristic of the genus *Nothopeus*.

*PSEBENA*, gen. nov.

Head short, as broad as the prothorax; eyes finely faceted, deeply emarginate, with the lower lobes rounded, the upper very narrow; palpi short and slender. Antennæ (♀) a little longer than the body, slender, filiform; 3rd, 4th, and 5th joints subequal to one another, each twice as long as the 1st; 6th distinctly shorter than the 5th; the succeeding joints gradually diminishing in length. Prothorax subcylindrical, as broad as it is long. Elytra short, squamiform, not reaching beyond the apex of the first abdominal sternite. Prosternum narrowed behind; front coxæ prominent, their acetabula angulate outwards and



open behind. Mesosternum much broader than the prosternum; acetabula of middle coxæ open to the epimera. Metathoracic episterna rather broad in front, narrowed behind. Femora pedunculate at base, gradually thickened into a fusiform club towards the distal end. Hind legs much longer than either of the anterior pairs; first joint of hind tarsi longer than the three succeeding joints together. Abdomen normal, its intercoxal process rather broad, and obtuse in front.

This genus, which I was at first inclined to refer to Lacordaire's group *Psebiinæ*, seems to me, on fuller consideration of its characters, to be better placed in the *Necydalinæ*, although it differs from other members of this group in having no anterior prolongation of the head, the front from the interantennary ridge to the clypeal suture being relatively very short, and the clypeus scarcely broader than the labium. The *Psebiinæ* have certain characters, wanting to the present genus, which point to an affinity with the *Auxesinæ* and *Methiinæ*, and, through those groups, with the *Æminæ*.

*PSEBENA BREVIPENNIS*, sp. n. (Plate XIX. fig. 12, ♀.)

*Capite, prothorace, elytris ad basin, articulo primo antennarum et pedibus quatuor anterioribus rufo-testaceis; metasterno medio testaceo, lateraliter fusco; abdomine medio et pedunculis femorum posticorum pallide testaceis; ceteris nigro-fuscis aut nigris.*

*Long.* 13–16 mm.

*Hab.* Kuching in Sarawak, Sept. 29 and Dec. 4, 1899. Two female examples; in British Museum and Hope Collection, Oxford.

Head, prothorax, first joint of the antennæ, the four anterior legs, and the base of the elytra testaceous red. Metasternum testaceous in the middle, dark brown at the sides. Abdomen pale testaceous along the ventral surface from the base to the last segment, this segment and the lateral borders being, like the upper side, brownish black. Hind legs also black, with the femoral stalks pale testaceous or nearly white. The head and prothorax are covered with a very faint reddish pubescence, but the prothorax has two slightly raised areas on each side bare of pubescence. The inner portion of each elytron near the base is very closely punctulate and covered with a faint pubescence, the outer and apical parts being sparsely punctulate and more glossy.

### 3. COLEOPTERA: *Oleridæ*, by the Rev. H. S. GORHAM and C. J. GAHAN.

*CALLIMERUS CATENATUS* (Gorham). (Plate XXIII. fig. 54.)

*Nigro-subcæruleus, squamis albis ornatus; capite creberrime subtiliter, prothorace elytrisque parce distincte punctatis; prothorace nitido, oblongo, lateribus parum ampliatis, utrinque uni-impressis, cum marginibus anticis et posticis albosquamosis; elytris opacis, apicibus oblique truncatis, lunulis*



*duabus in singulo, externe apertis, albis; pectore albo; ore, antennis, palpis pedibusque testaceis.*

*Long.* 9 mm.

*Mas?* *Tibis posticis juxta apicem denticulo acuto externe munitis.*

*Hab.* N.W. Borneo, Kuching.

Allied to and somewhat resembling *C. mirabilis* Gorh. Narrow, elongate, and rather smaller than the unique type of that species; clothed (including the legs) with very fine hairs. The white markings are (as in other species of this genus) composed of snow-white scales. The pattern is different from that of *C. mirabilis* in that there are on each elytron but two white lunules unconnected; each pair form an oblong X, but are scarcely joined at the suture. The apex is truncate, as in *C. mirabilis*.

A single example, apparently a male, collected Oct. 6, 1899.

*TENERUS SULCIPENNIS* (Gahan).

*Niger; prothorace lateraliter nigro-viridescente, dimidio basali elytrorum et plaga sub-semicirculari ad basin pronoti pube rufo-velutina obtectis, dimidio apicali elytrorum atro-pubescente. Antennis articulis 3° ad 10<sup>um</sup> antice valde dilatatis, articulo 3° quam 4° paullo angustiore; pronoto ad medium basis paullo gibboso; elytris utrisque quadri-sulcatis, interstitiis sat latis, leviter convexis.*

*Long.* 11; *lat.* 2 $\frac{3}{4}$  mm.

*Hab.* Kuching (March 1900). Two examples; in British Museum and Hope Collection, Oxford.

This species seems nearest allied to *T. cingalensis* White and *T. parryanus* Gorh., but differs from these and from all other known species of the genus in having the third joint of the antennæ almost as strongly dilated as the fourth, and the elytra impressed with longitudinal grooves.

#### 4. COLEOPTERA: RHYNCHOPHORA, *Brenthidae*, by Dr. A. SENNA.

*DIURUS SHELFORDI* Senna. (Plate XX. fig. 6, ♀.)

Moderately elongate, stoutish, black, provided with whitish scales of differing size sunk in the punctures; the head and the metarostrum with punctiform close-set scales, the joints of the antennæ clothed with long accumbent scales.

♂. Head slightly longer than broad, with the sides almost straight and a fovea between the eyes, which are prominent; the metarostrum is twice as long as the head and hardly narrowed before the antennæ; the prorostrum is short, naked, dark reddish brown. The antennæ are inserted near the apex of the rostrum: the 3rd joint is longer than the 4th, the 4th a little longer than the 5th, the 7th and 8th subequal; the three apical joints are distinct, slightly thickened and finely pubescent.

The prothorax is similarly shaped as in *D. fuscillatus* (Gylh.), but comparatively broader; its upper surface is covered with

large irregular punctures, and marked on each side with a longitudinal line of rounded white scales, and in the middle with a line of small scales; moreover, punctiform scales are sunk in the punctures.

The elytra are slightly broader at the base than the prothorax in the middle, the sides are parallel, the apex is normally narrowed; they have above three narrow longitudinal costæ, the interstices between which are punctate and provided with rounded scales; the sides are foveate, each fovea shows a setiform scale; moreover, a line of rounded scales is present along the lateral margin; the outer angles of the elytra at the apex are simply toothed.

The metasternum and the base of the abdomen are covered with rounded scales; the rostrum beneath and the legs are scattered with scale-like setæ. The 3rd abdominal segment is short and contracted in the middle.

♀. Agrees with the male in all respects except the following:—The body is broader; the head short, nearly square; the metarostrum is shorter, as long as the head; the prorostrum much more elongate, longer than the metarostrum; the antennæ are inserted between the middle of the rostrum and its base; they are comparatively shorter and stouter; the 3rd abdominal segment is longer and not contracted.

Length 17–23 mm.

*Hab.* Kuching (N.W. Borneo).

Allied to *D. furcillatus* (Gylh.), but the new species has the head shorter and the eyes more prominent; the prorostrum is shorter; the joints of the antennæ are longer, the three apical ones more distinct; the apex of the elytra are broader and slightly toothed; the body is shorter and stouter. The female of the new species is, moreover, distinguished by the metarostrum which is shorter, and by the antennæ which are inserted before the middle of the rostrum.

I have named this species in honour of Mr. R. Shelford, who has kindly presented an interesting collection of Bornean Brenthids to the Oxford University Museum.

*DIURUS SILVANUS* Senna. (Plate XX. fig. 4, ♀.)

The female of this species being hitherto undescribed, I give a short description of it:—

The head is nearly square, with a fovea between the eyes; the metarostrum is short, hardly so long as the head, channelled above, and slightly narrowed before the antennæ; the prorostrum is slender, glossy, finely punctured, as long as the head and metarostrum taken together. The antennæ, which are consequently more approximate to the base than to the apex of the rostrum, are rather stout, with the 3rd joint longer than the 4th, the 6th and 7th subequal, the 8th a little shorter, the three apical joints well distinct and separate. The prothorax is strongly contracted anteriorly, the sides towards the middle are almost

parallel. The elytra are longer than twice the prothorax, narrowed at and sloping rapidly to the apex; the tails are more approximate than those of *D. furcillatus* (Gylh.); moreover, they are short and almost straight.

This species, by the shape of the elytra at the apex, is allied to *D. erythropus* (Rits.), but easily distinguished by the longer pro-rostrum, by the insertion of the antennæ being more approximate to the base of the rostrum, and by the three apical joints being well distinct and separated.

Length 30 mm. (the tails excluded).

*Hab.* Matang (Borneo).

## EXPLANATION OF THE PLATES.

### PLATE XIX.

Figures 16 to 19 are about twice the natural size: the remainder about  $\frac{2}{3}$  of the natural size.

- |  |                              |
|--|------------------------------|
| Fig. 1. <i>Tricondyla cyanea</i> (Lep.), var. <i>wallacei</i> (Thoms.).          | Kuching, Feb. 1899.          |
| 2. <i>Condylodera tricondyloides</i> (Westw.), mature individual.                | Kuching, March 2, 1900.      |
| 3. <i>Tricondyla gibba</i> (Chaud.).   | Matang, Aug. 1899.           |
| 4. <i>Condylodera tricondyloides</i> (Westw.), immature individual.              | Kuching, Dec. 12, 1899.      |
| 5. <i>Collyris sarawakensis</i> (Thoms.).  | Kuching, May 14, 1900.       |
| 6. <i>Condylodera tricondyloides</i> (Westw.), very young individual.            | Kuching, July 18, 1900.      |
| 7. <i>Pheropsophus agnatus</i> (Chaud.).   | Kuching, Aug. 20, 1897.      |
| 8. <i>Gryllacris</i> , n. sp. <i>vicinissima nigratæ</i> (Br.).                  | Sarawak.                     |
| 9. <i>Alcides</i> sp.  | Kuching, April 20, 1900.     |
| 10. <i>Issus bruchoides</i> (Walk.).   | Kuching, Sept. 14, 1899.     |
| 11. <i>Sclethrhus amœnus</i> (Gory).   | Kuching, May 14, 1900.       |
| 12. <i>Psebenia brevipennis</i> (Gahan).   | Kuching, Dec. 4, 1899.       |
| 13. <i>Obera strigosa</i> (Pasc.), var., from left side.                         | Kuching, July 26, 1899.      |
| 14. <i>Obera brevicollis</i> (Pasc.), from left side.                            | Kuching, March 15, 1899.     |
| 15. <i>Obera</i> , probably n. sp. near <i>strigosa</i> (Pasc.), from left side. | Matang, March 14, 1898.      |
| 16. Larva of <i>Eulyes amœna</i> (Fab.), from right side.                        | Kuching, probably 1899.      |
| 17. Larva of <i>Hymenopus bicornis</i> (Stoll), from right side.                 | Kuching, probably 1899.      |
| 18. Larva of <i>Eulyes amœna</i> (Fab.), dorsal view.                            | Kuching, probably 1899.      |
| 19. Larva of <i>Hymenopus bicornis</i> , dorsal view.                            | Kuching, probably 1899.      |
| 20. <i>Salinus aurosericeus</i> (Guér.).   | Kuching, July 3, 1899.       |
| 21. <i>Nothopeus intermedius</i> (Gahan), ♂.                                     | Penrissen, May 1899.         |
| 22. <i>Bracon</i> sp.  | Matang, Aug. 1899.           |
| 23. <i>Mantispa simulatrix</i> (McLachl.).                                       | Matang, Aug. 1899.           |
| 24. <i>Polistes</i> sp. near <i>diabolicus</i> (Sauss.).                         | Kuching, July 27, 1899.      |
| 25. <i>Mantispa</i> sp.  | Kuching, July 12, 1900.      |
| 26. <i>Polistes sagittarius</i> (Sauss.).  | Kuching, July 2, 1898.       |
| 27. <i>Mantispa</i> sp.  | Matang, 3600 ft., June 1900. |

### PLATE XX.

Figures 4a, 7a, 8a, and 10a are about 4 times the natural size: the remainder about  $\frac{2}{3}$  of the natural size.

- |  |                          |
|--|--------------------------|
| Fig. 1. <i>Baryrhynchus dehiscens</i> (Sch.), ♂.             | Matang, Aug. 1899.       |
| 2. <i>Baryrhynchus dehiscens</i> (Sch.), ♀.                  | Kuching, 1899.           |
| 3. <i>Alibora</i> sp.  | Kuching, Aug. 10, 1899.  |
| 4. <i>Diurus silvanus</i> (Senna), ♀.                        | Matang, Aug. 1899.       |
| 4a. Left elytron of above. Dorsal view of apex, $\times 4$ . |                          |
| 5. <i>Diurus forcipatus</i> (Westw.), ♂.                     | Kuching, Sept. 14, 1899. |
| 6. <i>Diurus shelfordi</i> (Senna), ♀.                       | Kuching, Nov. 2, 1899.   |

- Fig. 7. *Ægoprepis insignis* (Pasc.). Matang, Aug. 1899.  
 7a. Left elytron of above. Dorsal view of apex,  $\times 4$ .  
 8. *Stegenus dactylon* (Pasc.). Kuching, Oct. 31, 1900.  
 8a. Left elytron of above. Dorsal view of apex,  $\times 4$ .  
 9. *Dymascus porosus* (Pasc.). Kuching, July 9, 1900.  
 10. *Ectatosia moorei* (Pasc.). Kuching, April 3, 1900.  
 10a. Left elytron of above. Dorsal view of apex,  $\times 4$ .  
 11. *Ænidia* sp. Kuching, Feb. 1899.  
 12. *Serixia prolata* (Pasc.). Kuching, Sept. 20, 1899.  
 13. *Metrioidea apicalis* (Jac.), var. Kuching, Aug. 1, 1899.  
 14. *Entelopes*, n. sp. near *wallacei* (Pasc.). Sarawak.  
 15. *Aulacophora luteicornis* (Fab.), var. Sarawak.  
 16. *Tropinotopa simulator* (Pasc.). Kuching, Aug. 4, 1897.  
 17. *Ochralea nigripes* (Oliv.), var. Kuching, March 28, 1900.  
 18. *Astathes unicolor* (Pasc.)=*coccinea* (Pasc.). Kuching, Aug. 17, 1898.  
 19. *Carithea mouhoti* (Baly). Kuching, Aug. 8, 1899.  
 20. *Astathes splendida* (Fab.). Kuching, Aug. 1899.  
 21. *Antipha* ? *nigra* (All.), var. Kuching, Aug. 11, 1899.  
 22. *Astathes posticalis* (Thoms.). Kuching, Aug. 15, 1899.  
 23. *Haplosomyx albicornis* (Wied.). Brit. N. Borneo, Sandakan, about 1895-6. A. L. Cook.  
 24. *Astathes caloptera* (Pasc.)=*cyanipennis* (Thoms.). Brit. N. Borneo, Sandakan, about 1895-6. A. L. Cook.  
 25. *Aulacophora boisduvali* (Baly). Kuching, Sept. 13, 1899.  
 26. *Entelopes amœna* (Pasc.). Matang, Dec. 1898.  
 27. *Ænidia* sp. near *leta* (Baly). Penrissen, May 1899.  
 28. *Chreonoma*, ? n. sp. Penrissen, May 1899.  
 29. *Xylotrechus pedestris* (Pasc.). Kuching, March 28, 1900.  
 30. *Cylindrepomus peregrinus* (Pasc.). Kuching, March 28, 1900.  
 31. *Chlorophorus annularis* (Pasc.). Pankalan Ampat, 5-6000 ft., base of Penrissen, May 1899.  
 32. *Cylindrepomus comis* (Pasc.). Kuching, March 29, 1900.  
 33. *Cylindrepomus* ? form of *comis* (Pasc.). Matang, Aug. 1899.  
 34. *Daphisia* sp. ♀. Matang, 3600 ft., June 1900.  
 35. *Demonax viverra* (Pasc.). Penrissen, 4500 ft., May 17, 1899.  
 36. *Daphisia* sp. Kuching, Aug. 4, 1897.  
 37. *Clytanthus sumatrensis* (Lap. & Gor.). Trusan.  
 38. *Cryllis clytoides* (Pasc.). Kuching, July 17, 1899.  
 39. *Demonax mustela* (Pasc.). Pankalan Ampat, 5-6000 ft., base of Penrissen, May 1899.  
 40. *Leptura* sp. Penrissen, May 1899.  
 41. *Xylotrechus decoratus* (Pasc.). Penrissen, May 1899.  
 42. *Leptura* sp. near *histrionica* (Pasc.). Penrissen, 4200-4500 ft., May 1899.  
 43. *Chloridolum cinnyris* (Pasc.). Penrissen, May 1899.  
 44. *Leptura*, ? n. sp. Matang, Aug. 1899.  
 45. *Chloridolum* sp. near *thomsoni* (Pasc.). Penrissen, May 1899.  
 46. *Chloridolum thomsoni* (Pasc.). Kuching, July 20, 1900.  
 47. *Saperdides*, ? gen. ? sp. Matang, March 13, 1898.  
 48. *Xystrocera alcyonea* (Pasc.). Kuching, Sept. 7, 1897.

## PLATE XXI.

The figures are rather over  $\frac{2}{3}$  of the natural size.

- Fig. 1. *Delias pandemia* (Wallace), ♂. Borneo.  
 2. *Isbarta pandemia* (Rothsch.). Kina Balu Mt., Borneo, about 1896.  
 3. *Delias aglaia* (Linn.), ♀. Brit. N. Borneo. Pryer, 1878-98.  
 4. *Isbarta dissimulata* (Walk.). Sarawak. Wallace.  
 5. *Delias cathara* (Grose-Smith). Penrissen, 3500 ft., May 19, 1899.  
 6. *Callamesia* (*Cyclosia*) *piepidoides* (Walk.). Penrissen, 3500 ft., May 19, 1899.  
 7. *Scrobigeria hesperoides* (Walk.). Limbang River, N. of Sarawak, April 1895. E. Bartlett.



Fig. 8. *Eterusia obliquiaria* (Walk.).

Saribas, 100 miles N.E. Kuching,  
Nov. 1900.

9. *Danisepa lowei* (Butl.).

Brit. N. Borneo, Sandakan,  
about 1895-6. A. L. Cook.  
Kuching, Nov. 1895.  
Borneo.

10. *Mimeuplœa rhadamantha* (Butl.), ♂.

11. *Penoa menetriesii* (Feld.).

12. *Mimeuplœa tristis* (Jordan), ♀.

13. *Trepsichrois mulciber* (Cram.).

Kuching, Oct. 1895.  
Brit. N. Borneo, Sandakan,  
about 1895-6. A. L. Cook.  
Sarawak. Wallace.

14. *Pompelon marginata* (Guér.).

#### PLATE XXII.

Figures 1 and 2 are about  $\frac{3}{4}$  of the natural size: the remainder  
about  $\frac{5}{8}$  of the natural size.

Fig. 1. *Xylocopa latipes* (Drury).

Matang, March 1898.

2. *Hyperchia fera* (v. d. Wulp).

Kuching, Feb. 1899.

3. *Collyris emarginata* (MacL.).

Mt. Serambu, Dec. 1898.

4. *Sepedon* sp. near *javanicus* (Desv.).

Mt. Serambu, Dec. 1898.

5. *Mesostenus* sp. near *pictus* (Smith).

Penrissen, May 1899.

6. Gen. et sp. ? Fam. Stratiomyidæ, Subfam.  
*Raphiocerineæ*.

Penrissen, May 1899.

7. *Mesostenus* sp.

Pankalan Ampat, 5-6000 ft.,  
base of Penrissen, May 1899.

8. ? *Xylophagus* sp.

Penrissen, May 1899.

9. *Salix sericosoma* (Smith).

Kuching, Feb. 2, 1898.

10. *Laphria* sp. near *terminalis* (v. d. Wulp).

Kuching, July 29, 1899.

11. *Macromeris violacea* (Lep.).

Matang, March 13, 1898.

12. *Midas* n. sp.

Mt. Santubong, Aug. 1900.

13. *Vespa cineta* (Fab.).

Matang, 3600 ft., June 1898.

14. *Milesia vespoides* (Walk.).

Kuching, April 3, 1900.

#### PLATE XXIII.

The figures are slightly reduced.

Fig. 1. *Ectatops rubiaceus* (A. & S.).

Matang, Dec. 1897.

2. *Serinetha abdominalis* (Fab.).

Botanic Gardens, Singapore,  
Jan. 1899.

3. *Phaуда limbata* (Wlgrn.).

Botanic Gardens, Singapore,  
Jan. 1899.

4. *Lycostomus gestroi* (Bourg.), ♀.

Kuching, July 12, 1899.

5. *Lycostomus gestroi* (Bourg.), ♂.

Mt. Santubong, 2600 ft.,  
Feb. 4, 1900.

6. *Erythrur rotundicollis* (Gahan), ♂.

Mt. Santubong, 2600 ft.,  
Feb. 4, 1900.

7. *Erythrur sternalis* (Gahan), ♂.

Matang, 3600 ft., June  
1900.

8. *Erythrur apiculatus* (Pasc.), var.

Matang, Aug. 1899.

9. Rhipidoceridæ, ? gen. *Ennomates*.

Matang, Dec. 1898.

10. Eucnemidæ, ? gen. ? sp.

Kuching, July 2, 1900.

11. *Calochronus* (*Micronychus*) *dispar* (C.  
Waterh.), ♀.

Matang, Aug. 1899.

12. *Pyresthes virgata* (Pasc.).

Matang, 3600 feet, June  
1900.

13. *Eurycephalus lundii* (Fab.).

Kuching, May 7, 1900.

14. *Tenerus sulcipennis* (Gahan).

Kuching, March 14, 1900.

15. *Gonophora wallacei* (Baly), var.

Kuching, May 28, 1900.

16. *Metriorrhynchus kirschi* (C. Waterh.), ♂.

Kuching, Aug. 15, 1899.

17. " " (C. Waterh.), ♂.

Kuching, May 28, 1900.

18. *Ephies dilaticornis* (Pasc.), var. ♂.

Matang, 3600 ft., June  
1900.

19. *Erythrur biapicatus* (Gahan), ♀.

Matang, 3600 ft., June  
1900.

20. *Agonischius* ? *sanguineipennis* (Cand.).

Kuching, May 16, 1900.

21. *Agonischius pectoralis* (Cand.).

Kuching, May 16, 1900.

22. Reduviid sp.

Sarawak.

23. *Melampyrus acutangulus* (Bourg.), ♂.

Matang, Aug. 1899.

24. *Cautires excellens* (C. Waterh.), ♀.

Kuching, Sept. 6, 1899.



- Fig. 25. *Xyaste fumosa* (Pasc.).  
 26. *Xyaste invida* (Pasc.).  
 27. *Gonophora wallacei* (Baly).  
 28. *Taphes brevicollis* (C. Waterh.), ♀.  
 29. *Ditonectes* sp. near *fuscicornis* (Gorh.).  
 30. *Caria dilatata* (Fab.).  
 31. *Prioptera octopunctata* (Fab.).  
 32. *Entelopes glauca* (Guér.).  
 33. *Blachia ducalis* (Walk.).  
 34. Locustid of new genus near *Gammarotettix*.  
 35. *Lema quadripunctata* (Oliv.).  
 36. *Apoderus javanicus* (Jekel).  
 37. Pterophorid, probably near genus *Coremagnia*.  
 38. *Bracon* sp.  
 39. Homopteron of genus probably near *Brixia*.  
 40. *Epania singaporensis* (Thoms.).  
 41. *Melipona vidua* (Lepel.).  
 42. Capsid sp.  
 43. *Holocephala* ? *hirsuta* (v. d. Wulp).  
 44. *Megalocolus notator* (Walk.).  
 45. Reduviid sp.  
 46. *Toxophora*, n. sp. near *javana* (Wied.).  
 47. *Bracon* sp.  
 48. *Mutilla* sp. near *urania* (Smith).  
 49. *Tillicera*, n. sp. ? near *T. bibalteata* (Gorh.).  
 50. *Cladophorus atrofuscus* (C. Waterh.), ♀.  
 51. " " (C. Waterh.), ♀.  
 52. *Tenerus sulcipennis* (Gahan).  
 53. *Callimerus bellus* (Gorh.).  
 54. *Callimerus catenatus* (Gorh.).  
 55. *Daphisia pulchella* (Pasc.).  
 56. *Spathomeles*, n. sp. near *S. turritus* (Gerst.).  
 57. *Zelota spathomelina* (Gahan).  
 58. *Erythrus virilipennis* (Gahan).  
 59. *Prionocerus ceruleipennis* (Perty).  
 60. *Tetralanguria pyramidata* (Fab.).  
 61. *Botryonopa cyanipennis* (Baly).
- Kuching, March 23, 1900.  
 Kuching, July 10, 1899.  
 Kuching, Aug. 1897.  
 Kuching, Jan. 24, 1900.  
 Kuching, Sept. 6, 1899.  
 Matang, March 13, 1898.  
 Sarawak.  
 Penrisen, May 1899.  
 Kuching, Dec. 13, 1900.  
 Kuching, Feb. 2, 1901.  
 Kuching, Oct. 12, 1899.  
 Kuching, April 4, 1900.  
 Kuching, Jan. 16, 1901.  
 Kuching, April 24, 1900.  
 Kuching, Jan. 17, 1901.  
 Penrisen, May 1899.  
 Kuching, May 8, 1900.  
 Kuching, June 22, 1900.  
 Kuching, May 3, 1900.  
 Kuching, April 24, 1900.  
 Kuching, Sept. 16, 1899.  
 Kuching, May 16, 1900.  
 Kuching, Aug. 11, 1900.  
 Kuching, July 17, 1899.  
 Kuching, Aug. 1899.  
 Kuching, March 15, 1900.  
 Kuching, April 14, 1900.  
 Kuching, March 30, 1900.  
 Kuching, Dec. 13, 1899.  
 Kuching, Oct. 6, 1899.  
 Kuching, June 19, 1900.  
 Kuching, Oct. 15, 1897.  
 Kuching, Dec. 12, 1899.  
 Matang, 3600 ft., June 1900.  
 Kuching, May 4, 1900.  
 Kuching, Dec. 8, 1899.  
 Kuching, Feb. 24, 1899.

## 2. On the Classification of the Fishes of the Suborder Plectognathi; with Notes and Descriptions of new Species from Specimens in the British Museum Collection. By C. TATE REGAN, B.A.<sup>1</sup>

[Received September 26, 1902.]

(Plates XXIV. & XXV.<sup>2</sup> and Text-figures 56-59.)

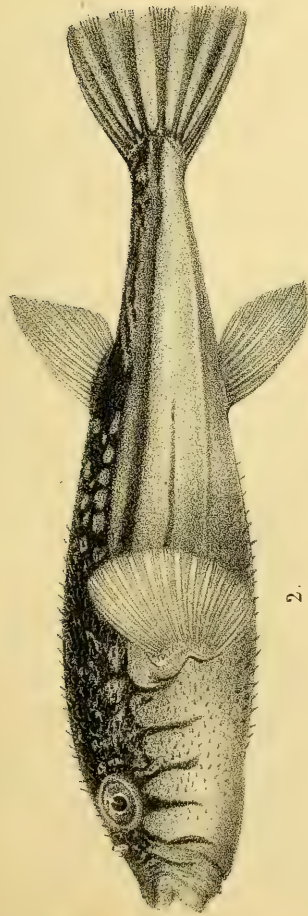
### PART I.—CLASSIFICATION.

In the systematic account which follows are embodied the results of a study of the Plectognathous fishes, and especially of their osteology, which I have made. The numerous characters of importance which have hitherto been overlooked or misunderstood by ichthyologists will serve as an apology for the present paper. My sincere thanks are due to Mr. Boulenger for criticism and suggestions, which his wide experience has made invaluable.

The Plectognathi are here treated of as a distinct suborder, as

<sup>1</sup> Communicated by G. A. BOULENGER, V.P.Z.S.

<sup>2</sup> For explanation of the Plates, see p. 303.



2.

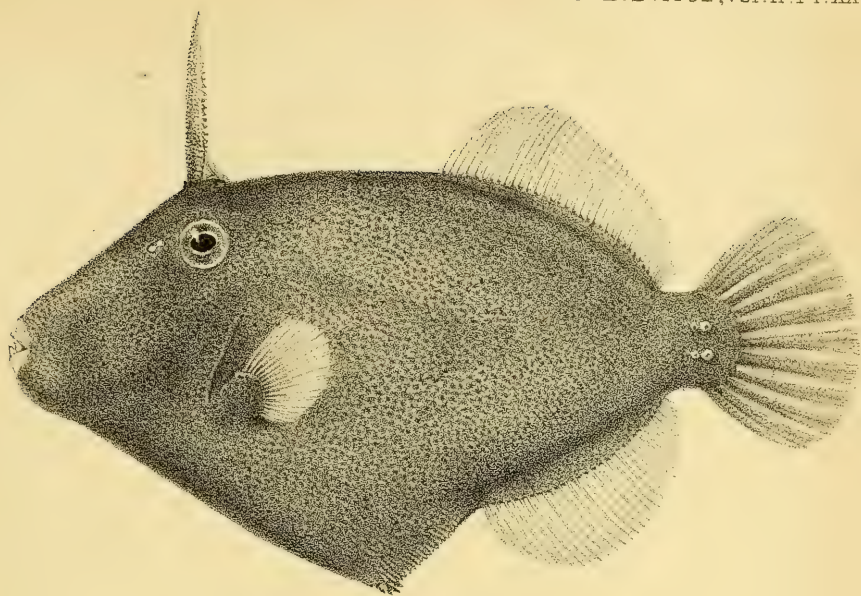


3.

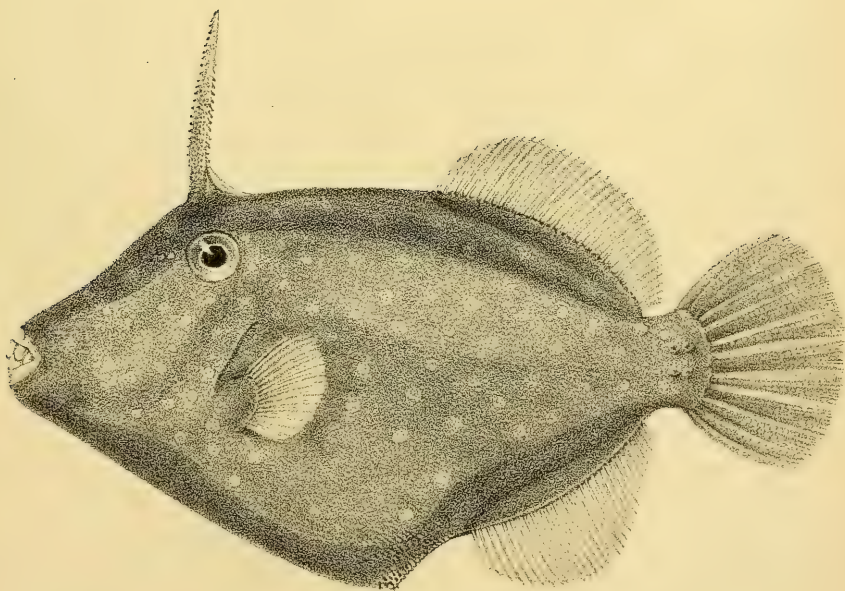


1.





2.



1.

J. Green del. et lith.

Mintern Bros. imp.

1. PSEUDOMONACANTHUS MULTIMACULATUS.

2. PSEUDOMONACANTHUS PUNCTULATUS.





although there can be no question as to the close relationship of the less specialized forms to the Acanthuridæ, their differences from that family are sufficiently great to admit of a definition which separates them from the Acanthopterygii, and at the same time includes the more aberrant and specialized forms.

The feature of most importance in diagnosing the suborder Plectognathi is the absence of ribs, although in some well-ossified epipleurals are present which have been mistaken for ribs. Two divisions are recognized, for which the names Sclerodermi and Gymnodontes, originally proposed by Cuvier, are retained. The Triodontidæ, however, are removed from the latter division and placed in the former, the structure of their pectoral arch and vertebral column, as well as the presence of a pelvis and of well-ossified epipleurals, indicating their close relationship to the Triacanthidæ and Balistidæ; whilst the coalescence of the teeth in the jaws is a feature of little importance, and has, as probably as not, originated independently in these fishes and in the Gymnodontes.

The Ostracientidæ do not seem to me to differ sufficiently from the Sclerodermi to rank as another division—Ostracodermi. Their very close relationship to the Balistidæ is apparent in their physiognomy and in the structure of their skeleton; whilst the absence of epipleurals and of the pelvis is obviously due to the development of the exoskeleton, which, however, is not very different from that of *Balistes*, many species of which have exoskeletal plates distinctly hexagonal in certain areas. I have inserted notes after the diagnoses, explaining the omission of characters before used or the addition of those now used for the first time.

#### Suborder PLECTOGNATHI.

Similar to the Acanthopterygii, but without ribs; with the post-temporal short, simple, and completely united by suture to the squamosal, and the pelvic bones, if present, more or less completely co-ossified. Branchial apertures very restricted. Pre-maxillaries and maxillaries often firmly united, opercular bones more or less reduced, and scales usually osseous or spinate.

Cuvier characterized the Plectognathi as having no ribs, but other systematists have generally agreed that ribs are present in *Balistes*, *Triacanthus*, *Triodon*, &c. I find that the so-called ribs of the Triacanthidæ and Balistidæ are epipleurals, which are attached to the anterior caudal vertebræ as well as to the præcaudals (text-fig. 56, p. 286), and are intermuscular bones, not bordering the abdominal cavity. I have unfortunately had no opportunity of examining the skeleton of *Triodon*, but have had to rely on the memoirs of Hollard<sup>1</sup> and Dareste<sup>2</sup>; but I think I am justified in supposing that in *Triodon*, as in *Balistes* and *Triacanthus*,

<sup>1</sup> Ann. Sci. Nat. (3) xx. 1853, p. 71; (4) viii. 1857, p. 275, and (4) xiii. 1860, p. 1.

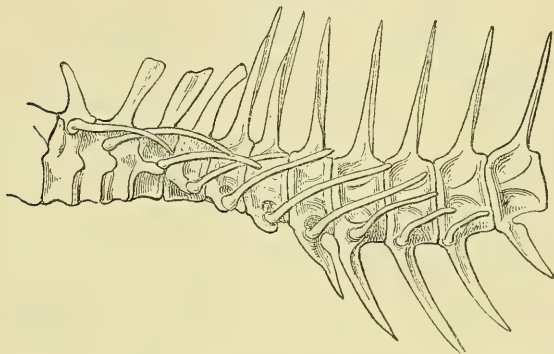
<sup>2</sup> Ann. Sci. Nat. (3) xii. 1849, p. 68, and (3) xiv. 1850, p. 105.

which it so closely resembles in other skeletal characters, the so-called ribs are epipleurals.

In the Plectognathi the post-temporal is more reduced and more intimately connected with the skull than in the Acanthuridæ, in which family it is attached by its proximal and distal ends, but separated from the skull by a foramen for most of its length.

The co-ossification of the pelvic bones is more complete in these fishes than in the Acanthuridæ.

Text-fig. 56.



Præcaudal and anterior caudal vertebræ, with epipleurals, of *Balistes aculeatus*.

In Dr. Gill's diagnosis of the Plectognathi occur the words: "The elements of the lower jaw consolidated into two pieces representing the rami;" this applies very well to the Sclerodermi, but in the Gymnodontes the suture between dentary and articulare is quite evident, and in *Mola* at any rate these bones can scarcely be described as consolidated. Another character used by Gill to define the Plectognathi is "Interoperculum detached from the other opercular bones, reduced and more or less rod-like in form." I find that in the Sclerodermi this bone is rod-like anteriorly, and posteriorly expanded and attached to the suboperculum, this posterior portion being in some cases, e. g. *Triacanthus*, strongly ossified, in others, e. g. *Ostracion*, almost entirely membranous. In the Gymnodontes it is rod-like, but only in the Tetrodontidæ is it unconnected posteriorly with the suboperculum.

#### Division I. SCLERODERMI<sup>1</sup>.

Supraclavicle vertical; pterygials (pectoral basalia) not enlarged, movably attached by ligament to the scapula and coracoid, three to the former and one to the latter. All the vertebræ with the neural arches forming a single spine. *Basis cranii* more or less distinctly double. Dentary and articulare completely co-ossified.

<sup>1</sup> *Trachycephalus* De Vis (*nec* Tschudi), described as a Scleroderm in Proc. Linn. Soc. N.S.W. viii. 1883, p. 455, is evidently not a Plectognath.

Spinous dorsal, if present, of few rays; no anal spines; ventrals, if present, each represented by a spine (rarely with the addition of one or two rudimentary soft rays). Caudal rays in small number, ten to eighteen.

Four families: Triacanthidæ, Triodontidæ, Balistidæ, and Ostraciontidæ.

In the fishes of this division the pectoral arch is very similar to that of the Acanthuridæ, except that the post-temporal is completely united suturally to the squamosal. The vertebral column also is like that of Perciform fishes; and although Dareste has ascribed to *Triodon* diapophyses on the posterior præcaudal and most of the caudal vertebræ, it is evident, from studying his figure and comparing with skeletons of *Triacanthus* and *Balistes*, that he is referring to the præzygapophyses, which are somewhat enlarged in this region in all these fishes.

#### Family 1. TRIACANTHIDÆ.

Præcaudal vertebræ with parapophyses from the third or fourth to the last; epipleurals present. Præorbital not ossified; ethmoid region high, a large nasal cavity bounded by ethmoid and præfrontal; palatine arch firmly united to the skull; premaxillaries protractile, free from the maxillaries; teeth in the jaws separate, conical or incisor-like; palate toothless; fourth upper pharyngeals toothed; lower pharyngeals separate; opercular bones reduced, but with their normal relations. Pelvis present, firmly united to the pectoral arch. Two nostrils on each side. Four gills, a slit behind the fourth; pseudobranchiæ present; six branchiostegals. Scales small, sometimes spinate or osseous. Spinous dorsal with two to six spines; soft dorsal and anal of moderate length or rather short; ventrals each represented by a strong spine, with an inner basal knob which locks it when everted, rarely with the addition of one or two rudimentary soft rays. Air-bladder present.

#### Genera.

1. TRIACANTHUS<sup>1</sup> Cuv.—Body compressed, caudal peduncle long and slender. Scales small, rough. Lateral line present. D. IV–V, 22–25; A. 16–20. Ventrals without soft rays. Caudal forked, with 12 rays. A series of incisors in each jaw, with a few inner rounded teeth. Twenty vertebræ.

2. TRIACANTHODES<sup>2</sup> Bleeker. — Body compressed, caudal peduncle short. Scales small, juxtaposed. No distinct lateral

<sup>1</sup> The Oligocene genus *Acanthopleurus* Agassiz has a rounded caudal, but in other respects seems scarcely different from *Triacanthus*.

<sup>2</sup> *Spinacanthus* Agassiz, from the Eocene of Monte Bolca, may belong to this family. It resembles *Triacanthodes* in its dorsal, anal, and caudal fins, except that the six dorsal spines are very long and strong. The eye is placed high, below the first dorsal spine, and the teeth are stout and conical. The pelvis and ventral fins were apparently not strongly developed, and Gill considers this fish to be the type of a separate family.

line. Dorsal with V-VI spines. Soft dorsal and anal rather shorter than in *Triacanthus*; ventrals usually with one or two rudimentary soft rays; caudal rounded. Jaws with a series of conical teeth, and usually a few inner teeth. *Hollardia* Poey seems not distinct from this genus.

3. HALIMOCHIRURGUS Alcock.—Body low, compressed, with short caudal peduncle. Scales small, spinate. No lateral line. Snout much produced, lower jaw projecting. D. II, 13; A. 12. Ventrals without soft rays. Caudal rounded. Teeth very small, conical, in a single series.

#### Family 2. TRIODONTIDÆ.

Præcaudal vertebræ without parapophyses; epipleurals well-developed. Premaxillaries not protractile, firmly united to the maxillaries; teeth in the jaws coalescent. Pelvis represented by a single long bone, movably attached to the pectoral arch. No spinous dorsal; soft dorsal and anal short; no ventrals. Abdomen with a dilatable sac, kept expanded by the movable pelvis; lower part of sac a flap of skin into which the air does not enter. In other characters like the *Triacanthidæ*.

##### *Genus.*

TRIODON.—Body compressed, caudal peduncle long and slender. Scales osseous. Caudal forked, with 18 rays. Twenty vertebræ.

Although unable to examine a skeleton of this genus, a study of the figures and descriptions published has convinced me that the skull, vertebral column, and pectoral arch are extremely like those of *Triacanthus*, whilst the scales, movable pelvis, ventral sac and flap are similar to those of the *Balistidæ*. The only features which link this family to the *Tetrodontidæ*, in the neighbourhood of which it has generally been placed, are the comparatively unimportant characters of the coalesced teeth and absent spinous dorsal. It would be interesting to know whether the fourth upper pharyngeals are well-developed and toothed, as in *Triacanthus*, or rudimentary and toothless, as in *Balistes*.

#### Family 3. BALISTIDÆ.

Præcaudal vertebræ with well-developed parapophyses to which epipleurals are attached. Præorbital more or less ossified. Ethmoid region long, without distinct nasal cavities. Palatine movably articulated with ectopterygoid, or else entirely free from it. Premaxillaries not protractile, firmly united to the maxillaries. Fourth upper pharyngeals rudimentary, not toothed. Incisor-like teeth in the jaws. Pelvis long, movable. Spinous dorsal with one to three spines, the first, if strong, followed by a second which locks it when erected. Soft dorsal and anal long or of moderate length. Ventrals, if present, represented by a single



short rough spine at the end of the pelvis. Most of the præ-caudal interneurals co-ossified to form a bony trough, attached to the skull, and receiving the retracted dorsal spines. In other characters similar to the two preceding families.

*Genera.*

1. *BALISTES* Linn.<sup>1</sup>—Body compressed, caudal peduncle short. Scales moderate or large, juxtaposed, osseous. Jaws usually even in front. Gill-openings behind the eyes. Dorsal usually with 3 spines—the first strong and just behind the eye, the second locking it when erected, the third, if present, remote from them. Soft dorsal with 23–35 rays. Anal with 20–30. Caudal rounded or truncate, the outer rays often more or less produced. Pelvis projecting. Ventrals represented by a short, rough, movable spine. The movable pelvis, abdominal sac, and ventral flap are very similar to those of *Triodon*, but much less developed. Palatine T-shaped, the cross-piece articulating with ethmoid and maxillary, the vertical limb with the ectopterygoid. Vertebrae 18.

2. *MONACANTHUS* Cuv.—Differs from *Balistes* in that the scales are smaller; the palatine is a straight rod attached to maxillary and ethmoid, having lost the lower vertical limb which in *Balistes* articulates with the ectopterygoid; the third dorsal spine is always absent and the caudal always rounded. The first dorsal spine is above the eye, and if it has distinct barbs these are usually arranged in two series. The gill-openings are often below the posterior part of the eye. There are 18 vertebrae.

In this genus are included all those species of *Monacanthus*, as understood by Günther, with a movable ventral spine.

The transition is perfect from those with a rough dorsal spine without distinct barbs, to those with a series of minute barbs on each side, and so to those with barbs strongly developed.

*M. penicilligerus* Cuv. belongs to this genus, the ventral spine being movable, and the barbs on the dorsal spine exactly similar to those of the closely-allied *M. tomentosus*, although their regular arrangement is obscured by the well-developed fleshy filaments. In the development of the ventral sac and flap, some species of this genus almost rival *Triodon*.

3. *PARALUTERES* Bleeker.—Differs from *Monacanthus* in that the single dorsal spine is weak, not fully erectile, and the ventral spine is absent, or small and fixed.

4. *PSEUDALUTERES* Bleeker.—Differs from *Monacanthus* in that the dorsal spine is in advance of the orbit, the ventral spine is absent, and the pelvis is entirely concealed.

5. *PSEUDOMONACANTHUS* Bleeker.—Differs from *Monacanthus* in that the ventral spine is immovable, ankylosed to the pelvis, and

<sup>1</sup> The Oligocene genus *Acanthoderma* Agassiz is scarcely distinguishable from *Balistes*.



the barbs of the dorsal spine, if distinct, are usually in four series. There are 19 or 20 vertebræ. In this genus the gradation is perfect from those species without barbs to those with four equidistant series of strong barbs.

6. *ALUTERA* Cuv.—Differs from *Pseudomonacanthus* in that the dorsal spine is feeble, the ventral spine is absent, the pelvis is entirely concealed, and the dorsal and anal rays usually in greater number. The lower jaw is projecting, the gill-openings oblique and below the eye, and the vertebræ number 21.

7. *PSILOCEPHALUS* Swainson.—Differs from *Alutera* in its more elongate body, very feeble dorsal spine, lower jaw with a barbel, gill-openings in advance of the eye, and vertebræ numbering 29–30.

This family has well-defined characters, and the relations of the various genera are very clear; its division into subfamilies is without value, and if *Balistes* and *Psilocephalus* are to rank as distinct families, *Monacanthus*, *Alutera*, *Paraluteres*, and *Pseudaluteres* should receive the same treatment, and the Balistidæ (as here understood) be raised to the rank of a division.

Some authors have stated that the symplectic is not ossified in the fishes of this and the next family. I find that in all cases it is present as a small but distinct ossification attached to the lower margin of the metapterygoid between stylo-hyal and quadrate; the stylo-hyal has shifted its attachment forwards from the hyomandibular to the anterior part of the lower margin of the metapterygoid, and has, as it were, pushed the symplectic in front of it.

#### Family 4. OSTRACIONTIDÆ.

Closely allied to the Balistidæ, but with feeble parapophyses, no epipleurals, præorbital not ossified, palatine immovable, pelvis absent, no spinous dorsal, no ventrals, soft dorsal and anal short. Clavicles, coracoids, and post-clavicles much expanded. Scales represented by large, juxtaposed, bony plates, mostly hexagonal and immovably united.

##### *Genera.*

1. *ARACANA* Gray.—Body ovate or orbicular. Carapace ceasing before the dorsal and anal fins, with more or less distinct longitudinal ridges, 3 on each side, and often a dorsal and ventral ridge; some isolated plates on the caudal peduncle. D. 10–12. A. 10–12. Caudal truncate or rounded. Sixteen vertebræ, not elongate, subequal in length except the two preceding the square hypural, which are shortened.

2. *OSTRACION* Linn.—Body 4- or 5-sided; carapace extending beyond and closed behind the anal fin, with two prominent ridges on each side and often a dorsal ridge. Caudal peduncle naked. D. 9–10. A. 9–10. Caudal truncate or rounded. Sixteen

vertebræ, not elongate, subequal in length except the three preceding the square hypural, which are extremely shortened.

3. *LACTOPHRYS* Swainson.—Body 3-sided ; carapace with three prominent ridges, a dorsal and two ventro-lateral. Vertebrae fourteen, the first eight elongate, the four preceding the oblong hypural shortened. In other characters like *Ostracion*.

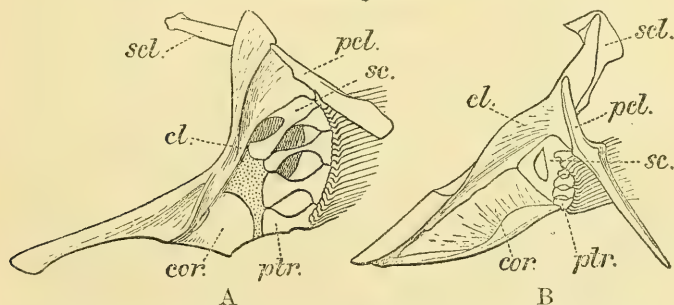
#### Division 2. GYMNOTONTES.

Supraclavicle oblique, sometimes nearly horizontal ; lower three pterygials enlarged and immovably united to the coraco-scapular cartilage ; upper pterygial small, suturally united to the scapula (see text-fig. 57). Anterior vertebrae with bifid divergent neural spines. *Basis cranii* simple. Suture between dentary and articulare evident. Pelvis absent. No spinous dorsal ; no anal spines ; no ventrals ; caudal rays, if present, ten to twelve in number.

Three families : Tetrodontidæ, Diodontidæ, Molidæ.

I cannot find that the true interpretation of the bones of the pectoral arch in these fishes has been previously published. On a superficial examination there appears to be no scapula, and the pectoral fin to be supported by a series of four enlarged pterygials. In fact, the united upper pterygial and scapula together resemble one of the enlarged pterygials, both in size and shape, whilst the

Text-fig. 57.



Right half (inner side) of pectoral arches of (A) *Diodon punctulatus* and (B) *Balistes verrucosus*.

scl., supraclavicle ; cl., clavicle ; pcl., postclavicle ; sc., scapula ; cor., coracoid ; ptr., pterygials.

scapular foramen corresponds to one of the series of interspaces between them. The feature of the pterygials being immovably attached to the scapula and coracoid, either directly or synchronously, is worth notice. The pectoral arch is so strikingly similar in all three families, that Siebenrock's suggestion that in *Mola* the bone which attaches the clavicle to the skull is the post-temporal, and not the supraclavicle as in Tetrodontidæ, cannot be accepted.

It has been asserted that the term *spina bifida* is not correctly applied to the neural spine of the anterior vertebræ in these fishes, because the neural canal is closed; but in the Molidæ this is not the case, and in the Diodontidæ the neural canal is open above in the posterior præcaudal region; the anterior bifid spines are in all cases obviously homologous and forming one series with the single neural spines which succeed them, and when the neural canal is closed by a bony roof this must be regarded as a secondary feature, due to the meeting of outgrowths from the base of the neural spine of each side after they have separated.

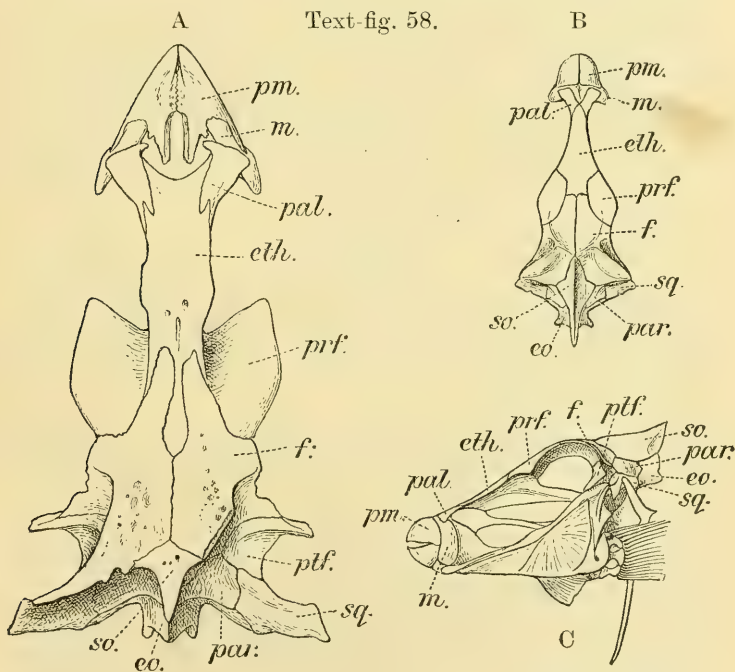
#### Family 1. TETRODONTIDÆ.

Præcaudal vertebræ without parapophyses, the first four or five with bifid neural spine and closed neural arch; no epipleurals. Præorbital not ossified; palatine firmly united to the skull; no distinct bony nasal cavity; premaxillaries not protractile, united to maxillaries; teeth in the jaws coalescent, in each forming a beak with median suture; palate toothless; fourth upper pharyngeals present, toothed; lower pharyngeals separate; interoperculum a long rod, attached to inner face of præoperculum, sometimes connected with operculum, never with suboperculum. Nostrils various. Four branchial arches, the fourth not bearing a gill, not followed by a slit; pseudobranchiæ present; six branchiostegals, the first a broad plate. Skin naked, usually with movable spines, rarely with bony plates. Caudal peduncle normal. Skeleton well-ossified. Belly very inflatable. Air-bladder present.

Many authors have failed to understand the evolution of the nasal organs in this family, as is shown by the wording of their diagnoses, such phrases as "nostrils represented by two solid tentacles on each side," "nostril with a tube," &c. being quite misleading. In the more primitive forms (*Lagocephalus*) there are two nostrils on each side, situated in an oval nasal area, which overlies an internal nasal sac, exactly as in *Balistes*, *Triacanthus*, &c. From these we pass to fishes (*Spheroides*) in which the nasal area is raised up into a more or less prominent tubular papilla bearing the two nostrils, whilst the nasal sac is scarcely sunk below the level of the skin, and is in great part represented by the interior of the papilla, on the walls of which are the terminations of the olfactory nerve. By the absorption of the septum between the nostrils at the end of the papilla they become confluent, and we get a circular tube produced terminally into two more or less distinct lips or tentacles, in the more specialized of which the circular tube is short and constricted, so that we have two tentacles, on the inner surface of which are the terminations of the olfactory nerve, united basally. Thus when the nostrils become confluent the interior of the nasal sac is exposed, and in some species of *Tetrodon* it may be said to be raised above the level of the skin. In *Tropidichthys* the circular tube has degenerated to an inconspicuous rim with a minute aperture. In

*Xenopterus* and *Chonerhinus*, on the contrary, it has become excessively developed.

Dr. Gill (Proc. U.S. N. M. xiv. pp. 705-720, pl. xxxiv. (1890)) has arranged the fishes which I here include in the family Tetrodontidæ in three families: Tetrodontidæ, Chonerhinidæ, and Canthigasteridæ, which are chiefly distinguished by supposed cranial differences. In the Canthigasteridæ and Chonerhinidæ the post-frontals are said to meet in the middle line, thus separating the frontals from the supraoccipital. An examination of the skeletons has convinced me that in these fishes the post-frontals are confined to the sides, and that the frontals are in contact with the supraoccipital. The erroneous statements and figures of Hollard have met with too ready an acceptance, that author having mistaken ridges on and fissures in the frontal bones for sutures between them and the post-frontals. The Canthigasteridæ are also defined as having a long prominent



A. Skull of *Tetrodon sceleratus*, seen from above (on the right the postero-lateral process of the frontal has been removed).

B. Skull of *Tropidichthys papua*, seen from above.

C. " " " side view.

pm., premaxillary; m., maxillary; pal., palatine; eth., ethmoid; prf., præfrontal; f., frontal; ptf., postfrontal; sq., squamosal; par., parietal; eo., exoccipital; so., supraoccipital.



ethmoid, in opposition to the Tetrodontidæ, with short or narrow ethmoid, not prominent. I find that in *Tetrodon lagocephalus*, *scleratus*, *levigatus*, &c. the ethmoid is long, by no means narrow, and at least as prominent as in any species of the so-called Canthigasteridæ. The Chonerhinidæ are also separated on account of the increased number of vertebræ and dorsal and anal rays, but as in the Tetrodontidæ the vertebræ vary from 17 to 22 in number, and the dorsal rays from 6 to 19, it is scarcely logical to separate from them *Chonerhinus*, with 24 vertebræ and 25-26 dorsal rays, nor *Xenopterus* with 29 vertebræ and 32-38 dorsal rays, on that account alone.

The question as to how many genera it is convenient or useful to recognize in this family is a very vexed one. Perhaps, on account of the many strange and abnormal features which unite the Tetrodontidæ and distinguish them from more typical fishes, one is rather apt to overlook the differences which exist among them; nevertheless, it is very evident that many of the so-called genera are incapable of definition and cannot be maintained.

The genera *Ephippion*, *Tropidichthys*, *Chonerhinus*, and *Xenopterus* can be easily defined; but I am inclined to unite the remaining species in a single genus *Tetrodon*, as the differences in the structure of the skull and of the nasal organ show so many gradations that they can hardly be used for generic diagnoses.

In *Tetrodon psittacus* Bl. Schn. I find that the frontals extend to the orbital margins, therefore *Colomesus* Gill, if a valid genus, has not been correctly diagnosed.

#### Genera.

1. **TETRODON** Linn.—Body oblong or elongate, broad or somewhat compressed, prickly or smooth. D. 6-19. A. 6-17. Vertebræ 17-22. Prefrontals, frontals, and post-frontals with lateral expansions which form the orbital roof. Nostrils either separate or confluent.

2. **EPHIPPION** Bibr.—Differs in having the body armed with bony plates. Nostrils confluent. Skeleton unknown.

3. **TROPIDICHTHYS** Bleeker.—Body compressed. D. 8-10. A. 8-10. Vertebræ 18. Nostrils confluent, a single small aperture on each side. Ethmoid long, narrowed forwards. Posterior part of frontals with paired lateral crests.

4. **CHONERHINUS** Bleeker.—Differs from *Tetrodon* in that the dorsal and anal fin-rays are in increased number, as are the vertebræ (D. 25-26. A. 23-25. Vertebræ 24). The prefrontals small, without lateral expansions. The nasal organs are very similar to those of *T. patoca*, but developed into a large funnel-shaped rim.

5. **XENOPTERUS** Hollard.—Differs from *Chonerhinus* in having more vertebræ and dorsal and anal rays (Vertebræ 29. D. 32-38.

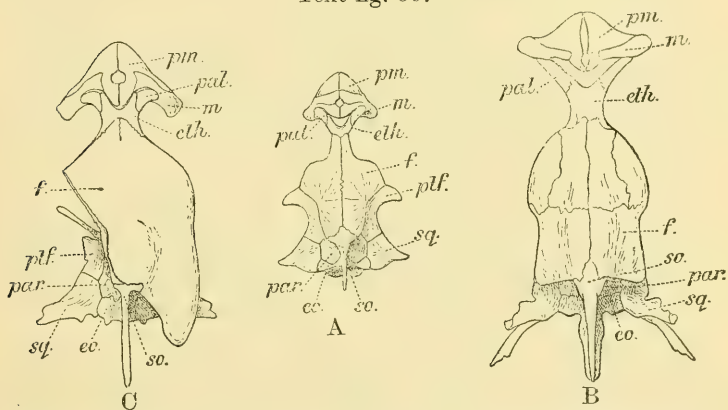


A. 28-32), whilst the frontals have large postero-lateral expansions, completely roofing-in the post-frontals, which are invisible from above.

[Since the reading of this paper I have been in communication with Dr. Pellegrin of the Paris Museum, who has examined the skeleton of *Xenopterus bellangeri* described by Hollard, and also the spirit-specimens referred to that species. These latter he is unable to distinguish from *X. naritus* Richardson; but the skull figured by Hollard differs considerably from that of *X. naritus*, and, unless these differences should prove to be sexual, must be regarded as belonging to a distinct species, although the number of vertebrae (29) and of fin-rays (D. 34, A. 29) are the same in each case.

In *X. bellangeri* the frontals are scarcely thickened, they show lines resembling sutures, corresponding to similar lines in *Chonerhinus modestus* Bleeker, and due to the texture of the bone, and

Text-fig. 59.



Skulls of (A) *Chonerhinus modestus*, (B) *Xenopterus bellangeri*, and (C) *Xenopterus naritus*, seen from above; in the latter the left postero-lateral extension of the frontal has been cut away. Lettering as in text-fig. 58.

their postero-lateral expansions do not extend over the parietals and squamosals. *X. naritus* differs in having very thick frontals, without any trace of lines of ossification and even the median suture obscure, and with strong postero-lateral expansions roofing-in parietals and squamosals.

Through the kindness of Dr. Pellegrin, to whom I take this opportunity of expressing my gratitude for the trouble he has taken, I am enabled to reproduce a drawing of the skull of *X. bellangeri* already figured by Hollard, for comparison with those of *X. naritus* and *Chonerhinus modestus*. Hollard's skeleton must be regarded as the type of *X. bellangeri*; it is 280 mm. in total length.—Dec. 20, 1902.]

## Family 2. DIODONTIDÆ.

All the præcaudal vertebræ with bifid neural spine; anterior caudals with bifid divergent hæmal spines instead of closed hæmal arch. Behind the dorsal and anal fins the neural and hæmal spines are single, but bifurcate distally. Teeth in the jaws coalescent, forming a beak without median suture; internal dentigerous plates well-developed. Interoperculum rod-like, attached posteriorly to the rod-like anterior limb of the suboperculum. In other characters essentially similar to the Tetrodontidæ, but with a less strongly ossified skeleton and larger dermal spines.

I am inclined to think that only two genera are capable of clear definition: DIODON, corresponding to *Diodon*, *Chilomycterus*, *Dicotylichthys*, and *Atopomycterus* of Günther's Catalogue, of which *Trichodiodon* and *Trichocyclus* are probably young forms; and LYOSPLÆRA.

The skeleton is in all exactly similar, and the differences in the nasal organs are not well marked, as although some species have a tubular papilla with two nostrils, others a two-lipped tube, in many of the former the septum between the nostrils is so easily and so often torn that the condition in the latter results. Also those species with two-rooted movable spines are connected with those with three-rooted fixed spines by a series of species with both sorts of spines in varying proportions.

*Genera.*

1. DIODON Linn.—Body stout, with strong spines. Nostrils in a tubular papilla, sometimes confluent. D. 10–15. A. 10–15. Vertebræ 21 or 22. Frontals much expanded. Post-frontals in contact with supraoccipital, separating parietals and frontals.

2. LYOSPLÆRA Evermann & Kendall.—Body oblong ovoid, covered with feeble spines attached to papery plates. Caudal peduncle very short. Two nostrils in a tubular papilla. D. 11. A. 4.

## Family 3. MOLIDÆ.

Præcaudal vertebræ without parapophyses; anterior præcaudals with divergent bifid neural spines and neural canal not roofed in; no epipleurals. Præorbital not ossified; no distinct bony nasal cavity; palatine firmly united to the skull; præmaxillaries not protractile, firmly united to the maxillaries; teeth in the jaws coalescent, forming a beak without median suture; palate toothless; fourth upper pharyngeals present, toothed; lower pharyngeals separate; interoperculum rod-like, attached posteriorly to the rod-like anterior limb of the suboperculum. Two nostrils on each side. Gills four, a slit behind the fourth; pseudobranchiæ present<sup>1</sup>; six branchiostegals, the first not enlarged. Skin

<sup>1</sup> The "accessory opercular gill" of so many authors is only a well-developed pseudobranch.

rough or tessellated. Body truncate posteriorly, without caudal peduncle. Caudal fin absent, the dorsal and anal fins confluent posteriorly. Skeleton moderately ossified. Air-bladder absent.

*Genera.*

1. *MOLA* Cuv.—Body ovate, compressed; skin thick, rough. Vertebrae 17.

2. *RANZANIA* Nardo.—Seems chiefly different from *Mola* in having the body covered with small hexagonal juxtaposed plates.

PART II.

*Notes on some Plectognathous Fishes, and Descriptions of some new species in the British Museum Collection.*

In these descriptions the length of head is measured from the tip of the snout to the upper end of the gill-opening, the depth of body at the level of the vent, the movable pelvis or inflatable belly making the measurement of the greatest depth uncertain.

*BALISTES NAUFRAGIUM* Jordan & Starks.

In descriptions of this species a feature of some importance has been overlooked, *i. e.* that the scales on the cheeks are arranged in parallel horizontal series, with naked lines intervening between those in front of the pectoral, and although closely allied to *Balistes capriscus* Linn. it is still closer to *B. flavimarginatus* Rüpp., and should have been placed in the genus *Xanthichthys* recognized by the authors who named it.

Incidentally this species demonstrates of what little value are genera based on features so trivial as those supposed to separate *Balistes* from *Xanthichthys*.

*BALISTES CASTANEUS* Richardson.

This species, described by Richardson in the 'Voyage of the Sulphur, Fishes' (p. 126, pl. 59), has been included by Günther in the synonymy of *Balistes capriscus* Linn., from which it differs in many ways, and I therefore take the opportunity of redescribing Richardson's type specimen.

Depth of body twice in total length, length of head 3 times. Snout 3 times as long as the eye-diameter, which is  $\frac{3}{4}$  of the interorbital width, which is less than  $\frac{1}{3}$  the length of head and equal to the length of the gill-opening. A groove below the nostrils; 2 or 3 enlarged plates behind the gill-opening. D. III, 28. A. 26. The first dorsal spine above the gill-opening, with about 8 vertical rows of minute tubercles anteriorly, somewhat curved, its length  $1\frac{3}{4}$  times in the length of head; second and third spines prominent; soft dorsal somewhat elevated anteriorly, the fifth ray the longest, longer than the first dorsal spine. Anal similar, but not so deep. Caudal truncate, with the outer rays slightly produced. Scales on the cheeks in oblique series without naked lines intervening, on the caudal peduncle not bearing

spines or tubercles. About 70 in a longitudinal series from the gill-opening to the caudal, about 20 in an oblique series from the base of the pectoral to the vent, and about 50 in an oblique series from the origin of the dorsal to the ventral spine.

Yellowish-brown, with darker dots and points on the body and fins. Lips white, with a semicircular white fold behind them on each side.

Pacific. Total length 135 mm.

*Balistes capriscus* has rather larger scales, and in a specimen of the same size the eye-diameter is about  $3\frac{2}{3}$  times in the length of snout,  $1\frac{3}{4}$  times in the interorbital width, and there are also other differences.

*PSEUDOMONACANTHUS PUNCTULATUS*, n. sp. (Plate XXV. fig. 2.)

Depth of body  $2\frac{1}{4}$  times in the total length, length of head 3 times. Snout nearly straight, but very slightly concave, about 4 times as long as the eye-diameter, which is  $\frac{2}{3}$  of the interorbital width. Gill-opening  $1\frac{3}{4}$  times as long as the eye-diameter, its upper and lower ends below the posterior and anterior margin of the eye respectively. D. II, 36. A. 32. Dorsal spine slightly in advance of the middle of the eye, with vertical rows of moderate-sized granules or tubercles anteriorly, the two rows on each side of the median row enlarged, but not forming distinct barbs; each lateral posterior edge with a row of conical tubercles (barbs) in its lower half; the length of the spine  $1\frac{2}{5}$  times in the length of head. Second ray of spinous dorsal not prominent. Soft dorsal and anal similar, rounded, the longest ray  $\frac{2}{5}$  the length of head. Pectoral as long as the gill-opening. Caudal rounded, half the length of head. Caudal peduncle deeper than long, with two pairs of small curved spines with points directed forward on each side. Ventral spine moderate, barbed. Scales represented by minute osseous granules.

Brown, with traces of numerous small darker spots on the sides. Caudal brownish, other fins immaculate.

Closely allied to *Pseudomonacanthus pardalis* Rüpp., which has a somewhat more declivous concave snout, tubercles on dorsal spine minute, slightly shorter head, narrower gill-opening, narrower interorbital space, &c.

A single specimen, 190 mm. in length, from Tahiti.

*PSEUDOMONACANTHUS MULTIMACULATUS*, n. sp. (Plate XXV. fig. 1.)

Depth of body  $2\frac{1}{6}$  times in the total length, length of head 3 times. Snout slightly concave, about  $3\frac{3}{4}$  times as long as the eye-diameter, which is  $\frac{2}{3}$  of the interorbital width. Gill-opening  $1\frac{1}{2}$  times as long as the eye-diameter, its upper and lower ends below the posterior and anterior margins of the eye respectively. D. II, 36. A. 32. Dorsal spine in advance of the middle of the eye,  $1\frac{1}{4}$  times in the length of head, armed almost exactly as in the preceding species, but with the anterior double row of



enlarged tubercles more prominent. Soft dorsal and anal similar, rounded, their longest ray half as long as the dorsal spine. Pectoral scarcely longer than the gill-opening. Caudal rounded. Caudal peduncle deeper than long, with two pairs of barbs on each side as in the preceding species. Ventral spine moderate, barbed. Scales as minute granules.

Greyish, with rounded lighter (? light blue) spots on the sides of head and body. Upper part of head and body, above a line from the tip of snout to the eye and thence to the last dorsal ray, brown. Lower part of the body with a similar brown area. Fins immaculate.

A single specimen from Tahiti, 175 mm. in total length.

Very closely allied to the preceding species, differing chiefly in the more concave snout, more strongly armed dorsal spine, and colour.

*PSEUDOMONACANTHUS DEGENI*, n. sp. (Plate XXIV. fig. 1.)

Depth of body equal to length of head, 3 times in the total length. Snout slightly convex, about  $3\frac{2}{3}$  times as long as the eye-diameter, which is equal to the interorbital width. Gill-opening about equal in length to  $\frac{2}{3}$  the eye-diameter, its upper end below the hind margin of the eye. D. II, 34. A. 33. Dorsal spine above the hind margin of the eye, without barbs, its length  $2\frac{2}{3}$  in that of the head; second spine scarcely visible. Soft dorsal and anal similar, rather elevated anteriorly, the rays increasing in length to the eighth or ninth, which is the longest and equal to half the length of the head, thence decreasing to about the twentieth, the rest subequal. Pectoral almost as long as the dorsal spine. Caudal rounded, more than half the length of head. Caudal peduncle longer than deep. Scales minute, shagreen-like. Ventral spine small.

Greyish, with blue spots on the sides of the head and anterior part of the body, and on the caudal peduncle. Some faint oblique blue lines on the sides between dorsal and anal fins. Fins green.

A single specimen, 190 mm. in total length, from Melbourne Market, Australia. Mr. Degen sent with the fish a drawing showing the colours when fresh.

This species is closely allied to *Pseudomonacanthus modestus*, Gthr., *ayraudi* Gthr., and *septentrionalis* Gthr., which it resembles in physiognomy and in the shape of the fins, but all these have distinct barbs on the dorsal spine.

*TETRODON INERMIS* Schlegel.

This species was considered by Günther to be a variety of the Atlantic *T. lavigatus*, and the descriptions of Schlegel and Day (Fishes of India, p. 701, pl. clxxx.) have not sufficiently pointed out the features which distinguish it from that species, the most noticeable of which are as follows:—In *T. inermis* the body is much broader and deeper in proportion to its length, there is no distinct lateral fold in the abdominal region, and the spines on



the belly are reduced to rows of granules; also the interorbital space is distinctly narrower, and the lateral line in that region much nearer to the supraorbital margin than in *T. levigatus*.

*TETRODON HYPSELOGENION* Bleeker.

With this species Günther has confounded a quite distinct species from Australia, and Day another very different species from the Indian Ocean, both of which are described below.

*TETRODON PLEUROGRAMMA*, n. sp. (Plate XXIV. fig. 2.)

*Tetrodon hypselogenion* (part), Günther, Cat. viii. p. 277 (1870).

A moderately developed lateral fold on the posterior part of the body. Nasal papilla moderately elevated, with 2 nostrils. Body rather broader than deep; the length of head about 3 times in the total length; snout as long as wide, about  $2\frac{1}{4}$  times in the length of head, eye-diameter  $4\frac{1}{2}$ – $5\frac{1}{2}$  times, interorbital width 6–7 times. The width of the ethmoid almost equal to that of the interorbital space, which is distinctly concave. The jaws subequal in height, with slightly concave cutting-edges, without distinct ridges at the sides of the median groove. Spines rather strong, thick-set, extending from the nostrils to the level of the hind margin of the pectorals on the back and sides, and from below the eye nearly to the vent on the abdomen. D. 9–11. A. 8–10, pointed, subequal in height, their longest rays about  $\frac{3}{5}$  the length of head. Caudal truncate.

Dark brown above, with irregular white spots; a golden band on the sides usually bearing one or two longitudinal dark stripes and separated from the colour of the back by a dark longitudinal stripe, that of each side being connected across the back by two rather indistinct dark cross-bands, one behind the pectorals, the other through the base of the dorsal; 5 or 6 subvertical dark stripes on the cheeks; abdomen white; fins immaculate.

Australia. Total length 135 mm.

This species differs entirely from *T. hypselogenion* Bleeker in the colour, in the stronger and more numerous spines with a more restricted distribution, in the interorbital space being concave instead of nearly flat, and in the more elevated dorsal and anal fins with the rays in greater number (usually D. 10, A. 9, in *T. pleurogramma*, and D. 8, A. 7 in *T. hypselogenion*).

*TETRODON BREVIPINNIS*, n. sp.

*Tetrodon hypselogenion*, Day, Fishes of India, p. 702, pl. clxxxiii.

Body with very indistinct lateral fold. Nasal papilla moderately elevated, with 2 nostrils. Body considerably deeper than broad; length of head  $2\frac{4}{5}$  times in total length; length of snout about  $2\frac{1}{4}$  times in the length of head, width of snout  $3\frac{1}{3}$  times, eye-diameter 4 times, interorbital width 9 times and equal to the width of ethmoid. Upper jaw smaller than lower, without distinct ridges at side of median groove, with slightly concave cutting-edges. Spines of moderate strength, rather wide set, on

all parts of the head, and on the body extending nearly to the dorsal fin on the back and to the vent on the abdomen and almost as far on the sides. D. 8, A. 7, pointed, with very short bases, the length of the base of the dorsal about 3 times in its height. Caudal weakly lunate.

Above, a dark brown network enclosing lighter rounded areas, sides yellow, abdomen white; some vertical stripes on the cheeks. Dorsal with about 4 obscure cross-bands. Caudal with about 7 vertical bands most distinct in its upper lobe.

Indian Ocean. Total length of the specimen described, from Celebes, 55 mm.

This species is easily distinguishable from *T. hypsologenion* Bleeker by the colour and the much more compressed body and narrower snout, and especially by the shortness of the bases of the dorsal and anal fins.

#### TETRODON OCELLATUS Linn.

To the synonymy of this species Günther has added *Tetrodon fasciatus* McClelland and *Tetrodon bimaculatus* Richardson, both of which I find to be quite distinct species, and I therefore give diagnostic descriptions of both. The specimen of *Tetrodon ocellatus* in the British Museum Collection, described as a variety with white annular and vermiculated markings on the back, is correctly referred to this species, as in every other character it is exactly similar to the more normal specimens, such as are figured by Richardson, Zool. Sulphur, Fishes, pl. 58.

#### TETRODON MACCLELLANDI, n. sp.

*Tetrodon fasciatus* McClell. Calc. Journ. Nat. Hist. iv. 1844, p. 412, pl. xxi.

An indistinct lateral fold on the caudal peduncle. Nasal papilla rather short, with 2 nostrils. Body considerably deeper than broad; the length of head about 3 times in the total length; snout wider than long, its length about  $2\frac{1}{2}$  times in the length of head, eye-diameter 6-8 times, interorbital width  $2\frac{1}{2}$  (adult) to  $3\frac{1}{4}$  (young) times, and  $2\frac{2}{3}$ - $3\frac{1}{3}$  times as wide as the ethmoid. Jaws subequal in height, without distinct ridges at the sides of the median groove, with slightly concave cutting-edges. Spines very small, close-set, extending from between the nostrils to the base of the dorsal on the back, and from below the level of the eye to the vent on the abdomen, these groups being connected by two bands of spines (sometimes incomplete), behind the eye and behind the pectoral. D. 17-19. A. 15-17, pointed, subequal in height, the longest ray more than half the length of head; caudal truncate.

In the young, alternate broad and narrow light cross-bands on the head and back in front of the dorsal, about 6 or 7 in number; the last dark band extending back horizontally on the caudal peduncle. During growth the light bands break up into spots and finally disappear. At all ages a dark ocellated spot at the

base of the dorsal, another on each side above the pectoral, and sometimes an obscure one at the base of the pectoral. Fins immaculate.

Shanghai, Chusan, and Ningpo. Total length 280 mm.

*Tetrodon ocellatus* is easily distinguished by its coloration, and by its much narrower ethmoid, fewer dorsal and anal rays (D. 14-15. A. 12-13), and by the spines extending forward only to between the eyes.

The name *fasciatus* is preoccupied by *Tetrodon fasciatus* Bl. Schn., founded on a short description and obviously incorrect figure of Seba, and not since recognized.

#### TETRODON BIMACULATUS Richardson.

Body without distinct lateral fold. Nasal papilla moderately elevated, with 2 nostrils. Body nearly as broad as deep; the length of head nearly 3 times in the total length; length of snout about  $2\frac{1}{2}$  times in the length of head, its breadth less than twice, eye-diameter about 7 times, interorbital width  $2\frac{1}{4}$  times, and about 3 times as wide as the ethmoid. Jaws subequal in height, without well-marked ridges at the sides of the median groove, and with slightly concave cutting-edges. Spines moderately strong, close-set, extending on the back from between the eyes nearly to the dorsal, and on the abdomen from below the level of the eyes to the vent; the snout, sides of head and body, and caudal peduncle naked. D. 13-14. A. 11-12, pointed, subequal in height, their longest ray nearly half the length of head. Caudal truncate.

Greyish above, white below; 11 or 12 dark transverse stripes on the head and back before the dorsal, the posterior ones becoming horizontal and running back on the caudal peduncle. A blackish spot on each side covered by the upper part of the pectoral, and another on the base of the pectoral.

Estuaries of Chinese rivers. Total length 140 mm.

This species is quite distinct from the preceding, with which Richardson considered it to be identical; and from *T. ocellatus* it is easily separated by its colour and by its much broader snout and ethmoid. Richardson's figure (Zool. Sulphur, Fishes, pl. 57) is excellent.

#### TETRODON PLEUROTICUS Günther.

To the synonymy of this species should be added *Tetrodon fasciatus* Macleay, Proc. Linn. Soc. N.S.W. ii. 1878, p. 365, pl. x. The three dark spots on the sides described by Günther terminate the quite distinct dark transverse bands on the back noted by Macleay, and the cross band between the eyes is also present.

#### TETRODON FLUVIATILIS Ham. Buch.

To the synonymy of this species should be added *Tetrodon waandersii* Bleeker, Nat. T. Ned. Ind. v. 1853, p. 194 (*Arothron waandersii* Blkr., *Leiodon waandersii* Blkr.). A comparison of

small specimens of this species with Bleeker's type specimen has convinced me of their specific identity. The supposed difference in the nasal organs is non-existent, they might impartially be described either as a short tube with two terminal lips, or as two tentacles united basally, although the former phrase is more applicable to the smaller specimens, the latter to the larger, as might be expected from what we know of the evolution of these organs.

*TETRODON PUSTULATUS* Murray.

The nasal organs in this species are almost exactly similar to those of the closely allied *Tetrodon patoca*, which has been placed in a different section on account of supposed differences in these organs.

*TETRODON BORNEENSIS*, n. sp. (Plate XXIV. fig. 3.)

Nasal organ an elevated tube, very indistinctly two-lipped, with a single terminal aperture. Body rather compressed, with dorsal keel more or less distinct, the caudal peduncle twice as deep as broad and not longer than deep. Length of head about  $2\frac{3}{4}$  times in the total length; snout not longer than broad, half the length of head; nasal organs midway between eye and end of snout; eye-diameter  $3\frac{1}{2}$ – $4\frac{1}{2}$  times in the length of head, inter-orbital width about  $2\frac{1}{5}$  times; ethmoid very narrow. Jaws sub-equal in height, the upper somewhat projecting, with fairly well-marked ridges on each side of the median groove; cutting-edges concave. Spines small, numerous, extending on the head and body from the level of the nostrils to that of the vent. D. 11. A. 10, rounded, not elevated. Caudal rounded.

Dark brown above, lighter below. A light cross-band between the eyes is continued forward on each side from the eye through the nasal organ to the end of the snout, and a broader band runs back on each side from the eye to meet its fellow in the mid-dorsal line. Sometimes irregular bands or reticulations on the sides and caudal fin. Dorsal and anal immaculate.

Sarawak. Total length 70 mm.

EXPLANATION OF THE PLATES.

PLATE XXIV.

- Fig. 1. *Pseudomonacanthus degeni* (natural size), p. 299.  
2. *Tetrodon pleurogramma* (natural size), p. 300.  
3. „ *borneensis* (natural size), p. 303.

PLATE XXV.

- Fig. 1. *Pseudomonacanthus multimaculatus* (reduced to  $\frac{7}{11}$ ), p. 298.  
2. „ *punctulatus* (reduced to  $\frac{7}{11}$ ), p. 298.



3. On the Transformations of *Papilio dardanus* Brown and *Philampelus megæra*; and on two new Species of South-African Heterocera. By Lt.-Col. J. MALCOLM FAWCETT.

[Received August 8, 1902.]

(Plate XXVI.<sup>1</sup>)

1. PAPILIO DARDANUS. (Plate XXVI. figs. 6, 7, larva; 8, 9, 10, pupa; 11, head of larva; 12, 13, female forms of imago bred.)

*Papilio dardanus* Brown, Ill. Zool. p. 52, t. 22 (1776).

♂ = *merope* Cramer, Pap. Exot. vol. ii. p. 87, pl. cli. figs. A, B (1777).

♀ = *cenea* Stoll, Suppl. Cramer, p. 134, pl. xxix. figs 1, 1 a (1791).

♀ = a variety of *hippocoon* Fabricius, Ent. Syst. iii. 1, p. 38 (1793).

DESCRIPTION.—*Larva, early stage.* Head greyish green, body dark chocolate-brown dorsally, abdomen, legs and claspers greyish green; broad white lateral stripes above the spiracles, meeting across the back on the 2nd, 5th and 6th, and 10th somites. On 1st somite a pair of long filamentous horns or tentacles minutely serrated with very short bristles, a pair of very short horns on 11th somite, and on the 12th somite a pair of similar horns to those on 1st somite but shorter, all greyish green in colour. The larva presents, in this stage, a great resemblance to the droppings of a small bird.

*Final stage.* Head green, body pale bluish green dorsally, abdomen, legs and claspers greyish white. On first somite a pair of short yellow tubercles from between which the Y-like organ (which is crimson paling to grey at the tips) is protruded when the larva is alarmed. On anal somite a pair of paler yellow tubercles; on 3rd somite a pair of black "eye-spots" surrounded by a white iris, subdorsally; a dorsal series of pale blue spots on 3rd to 6th somites, one on each somite. A yellowish-white subspiracular line from 4th somite to the tubercles at the anal extremity; spiracles reddish.

The larva in this stage is very limaciform, the divisions of the somites being very indistinct, and the body being very smooth and velvety.

Feeds on *Toddalia lanceolata* Lamarck, nat. ord. Rutaceæ. The larva feeds very low down on the plant, almost on the ground. It is always on the old leaves, and is very difficult to find.

*Pupa.* Pale yellowish green dorsally, darker green along the abdomen and wing-cases, and being almost flat and much expanded laterally, it looks exactly like one of the leaves of the food-plant. The palpi-covers, instead of being divergent as in other species of *Papilio*, converge to form a point, thus simulating the

<sup>1</sup> For explanation of the Plate, see p. 307.







point of a leaf; the lateral margins form a yellowish ridge from head to anal extremity, and are much expanded laterally at the point where the wing-covers are broadest; a thin raised median line dorsally and ventrally helps to complete the resemblance, by its likeness to the midrib of a leaf.

Mr. G. F. Leigh, F.E.S., has given me the following information, and is, I believe, the only person who has bred *P. dardanus* from ova in Natal.

A specimen of the common form of the female in Natal (*P. cenea*, Pl. XXVI. fig. 12) was captured and placed in confinement, and laid 42 eggs, 37 of which pupated and produced 17 male and 20 female insects. The eggs are white, and are generally laid on the underside of a leaf, not more than two eggs being deposited on one branch; the larval stages occupied one month, and the pupal stage fourteen days.

The species is double-brooded, larvæ having been found in February and in May, and probably they may be found in other months as well.

It will be seen from this that the female (from which Mr. Leigh bred his specimens from the egg) was one of the form which was described by Stoll as *P. cenea*, this being the form of the female most commonly met with in the Durban district, and that which appears to mimic *Amauris echeria* Stoll. Among the female imagines that resulted, there were, besides this form, also specimens of a form of female near the form described by Fabricius as *P. hippocoon*, this being a rarer form of the female in Natal (Plate XXVI. fig. 13); this form differs from the typical form of *P. hippocoon* from West Africa mainly in having a larger area of white on the hind wing than the latter, being modified in imitation of its model *Amauris dominicanus* Trimen (a local race of the West-African *Amauris niavius* Linnæus), which is also distinguished from the West-African form by having a larger area of white on the hind wing.

The males also differ from West-African specimens of *P. dardanus* in having the black discal spots and the marginal lunules on the upperside of the hind wing coalesced into continuous black discal fasciæ, and in the discal band on the underside of the hind wing being tinged with rust-colour instead of fuscous; they were also, as a general rule, a good deal smaller.

Mr. R. Trimen records the South-African form as a distinct species under the name of *P. cenea* Stoll (South-African Butterflies, iii. p. 243. n. 313), while Professor Aurivillius (Rhopalocera Æthiopica, p. 465. n. 8) considers *P. cenea* to be a "forma geographica" of *P. dardanus*.

The species is subject to almost endless variation, the differences given above between the South- and West-African races being by no means constant, and it appears to the writer impossible to divide them except as subspecies or local races.

## Family SPHINGIDÆ.

2. *PHILAMPELUS MEGÆRA*. (Plate XXVI. figs. 3, 4, larva; 5, pupa.)

*Sphinx megæra* Linnæus, Syst. Nat. i. p. 492. n. 19 (1758); Mus. Ulr. p. 358 (1764); id. Clerck, Icones, t. 47. fig. 2 (1759).

*Philampelus megæra* Walker, Cat. Lep. Het. B.M. viii. p. 179. n. 11 (1856).

*Euchloron megæra* Boisduval, Spec. Gén. Lép. Hét. i. p. 214 (1875).

DESCRIPTION.—*Larva*. Head green, body pale yellowish green, irrorated with minute black spots and strigæ; an indistinct pale subdorsal line, defined on the 1st, 2nd, and 3rd somites by fuscous lines, and on the remaining somites to the 11th by paired black spots at the junctions of the somites, and on the 11th somite by three triangular fuscous spots situated at the base of the horn. On 4th somite a pale greenish-white "eye-spot" defined outwardly by a black circle; a dorsal fuscous line from head becoming obsolescent on 5th somite; horn short and yellow; legs and claspers concolorous with the rest of the body; spiracles fuscous.

Before pupating the larva assumes a pinkish-brown hue (as shown in Pl. XXVI. fig. 4).

Feeds on common vine.

*Pupa*. Dark red-brown, profusely mottled with fuscous spots and strigæ, formed amongst leaves on the surface of the ground in a similar manner to those of species of *Cherocampa*.

The various larval stages are completed in about one month, and in February and March only fourteen days are passed in the pupal stage.

Mr. J. F. Quekett, Curator of the Durban Museum, who has reared examples of this species, and to whom I am indebted for these observations, informs me that the species is probably single-brooded, as he has never heard of, or come across, a second brood.

The perfect insect is not commonly met with at Durban, but may, perhaps, be sometimes overlooked owing to its superficial resemblance to the common *Cherocampa idricus* Drury, although the latter is a much smaller species.

## Family EUPTEROTIDÆ.

3. *RABDOSIA CLIO*, n. sp. (Plate XXVI. fig. 2.)

DESCRIPTION.—*Male*. Head and thorax reddish brown; abdomen and wings pale ochreous brown: fore wing crossed by a broad dark postmedial fascia; veins whitish, defined inferiorly by some black irrorations; a marginal series of pale wedge-shaped (cuneiform) lunules formed by the junction of the pale lines defining the veins, their apices reaching the margin of the wing;



the extremity of the wing is darker beyond these lunules, and also near the base between veins 1 and 2: hind wing with marginal lunules similar to those on the fore wing but paler and more indistinct. Cilia red-brown.

The specimen figured was reared from a larva in Pietermaritzburg in 1899, but the notes on its transformations were subsequently lost.

### Family NOCTUIDÆ.

#### Subfamily QUADRIFINÆ.

#### 4. *DERMALEIPA DASEIA*, n. sp. (Plate XXVI. fig. 1.)

**DESCRIPTION.**—*Male*. Head and thorax reddish brown; abdomen scarlet below, fuscous above. Fore wing reddish purple-brown, much irrorated with darker brown especially along the costal margin; a short subbasal dark line; a straight outwardly oblique antemedial line defined with dark fuscous outwardly; reniform large and dark, ringed with fuscous; an outwardly oblique post-medial line defined outwardly by a dark fuscous line; an irregular submarginal line of minute black spots between the veins. Hind wing apically and outwardly scarlet, inwardly black, the abdominal margin being fringed with a lateral tuft of long ochreous hairs. Underside scarlet, reniform black.

*Female*. Fore wing similar to that of the male but paler; hind wing with the black inner area divided into a median patch and a short submarginal fascia, the latter not reaching the outer margin of the wing near the anal angle, as in the male; no lateral tufts of long hairs on the abdominal margins. Underside as in the male.

This species presents considerable analogy to the well-known Indian species *Lagoptera juno* Dalman; the coloration being somewhat similar, and the lateral tufts of long hairs on the hind wing of the male being identical. This moth is a day-flier, and the writer has taken both sexes flying in brilliant sunshine in the covert known as "the Town Bush" near Pietermaritzburg, Natal, at about 3000 feet elevation in January.

#### EXPLANATION OF PLATE XXVI.

- Fig. 1. *Dermaleipa daseia*, male, p. 307.
2. *Rabdosa clic*, male, p. 306.
3. *Philampelus megæra*, larva, second last skin, p. 306.
4. Ditto. Full-fed, just before pupating.
5. Ditto. Pupa.
6. *Papilio dardanus*, larva, early stage, p. 304.
7. Ditto. Larva, full-fed.
8. Ditto. Pupa, dorsal view.
9. Ditto. Pupa, ventral view.
10. Ditto. Pupa, side view.
11. Ditto. Head of larva with tentacles protruded.
12. Ditto. Female form bred = *cenea* Stoll.
13. Ditto. Female form bred = var. of *P. hippocoön* Fabricius.



4. On a Collection of Mammals from Abyssinia, including some from Lake Tsana, collected by Mr. Edward Degen. By OLDFIELD THOMAS, F.R.S.

[Received October 27, 1902.]

By the generosity of a gentleman interested in Abyssinia, Mr. Edward Degen was enabled, during the first half of the present year, to make a collecting expedition to Abyssinia, the resulting specimens being all presented to the National Museum. While in Abyssinia Mr. Degen was able to go to the little-known Lake Tsana, in the centre of the country, where, so far as I can ascertain, no mammals have ever been collected since the time of Rüppell.

As might have been expected, the mammals obtained at this locality prove to be of the greatest interest, quite a number of them being new, notably the fine Otter, the large Mongoose, and the Hare, while others, only hitherto obtained by Rüppell, form most valuable accessions to the Museum. The most noteworthy of these latter is the little "*Mus imberbis* Rüpp.," for which I have found it necessary to propose a new genus.

The donor is to be congratulated on the highly satisfactory results of Mr. Degen's trip, so far as the mammals are concerned, the more so as this group had of necessity to receive only secondary attention as compared with the magnificent collection of Fishes, from which Mr. Boulenger has described so many novelties.

1. COLOBUS ABYSSINICUS POLIURUS Thos.

2 ♂. Dodgit, W. Shoa. 26 June, 1902.

2. PAPIO DOGUERA Puch.

♂. Ahouillet, Kutai. 21 June.

3. MEGADERMA COR Peters.

Dried specimen. Dhar-Ala, Danakil Country. 25 January.

"Found in this condition in a cave."

4. SCOTOPHILUS NIGRITA Schr.

♂ ♀. Harar. 10 January.

5. CROCIDURA DORIANA Dobs.

♂, 2 ♀ in skin, and ♂ in spirit. Addis Ababa. March and April.

"Caught in Legation Garden."

6. GENETTA, sp. inc. (near *G. dongolana* H. & E.).

o. Bijo. 16 January.

7. HERPESTES ICHNEUMON L.

♂. Billen, near the Hawash River in Adal country. 31 January.

8. *HERPESTES GALERA MITIS*, subsp. n.

♂. Zegi, Lake Tsana, 4000 feet.

A small-toothed Abyssinian representative of *H. galera*.

Fur long and coarse. General colour dark chocolate-brown all over, above and below, almost without annulations, some of the hairs only having a faint and scarcely distinguishable whitish subterminal ring. Head, feet, and tail darker even than the body, the last-named gradually becoming black terminally. A few wholly white hairs mixed with the fur of the fore-quarters.

Skull about the size of that of the true Southern *H. galera*, therefore considerably smaller than in the Central and East-African subspecies *robustus*. General form similar, but the posterior palate decidedly narrower, and the bullæ much lower and less prominent. Teeth smaller throughout, especially the last premolars above and below and the first molars.

Dimensions of the type (measured in skin):—

Head and body 600 mm.; tail 330; hind foot (c.) 100.

Skull—basal length 95; condylar length (basal length of P. Z. S. 1882, p. 65) 100; zygomatic breadth 62·5; interorbital breadth 21; breadth of brain-case 38; mastoid breadth 40·5; palate length from gnathion 56; breadth of posterior palate 8.

Teeth—greatest horizontal diameter of  $p^4$  10·8,  $m^1$  9·1,  $m^2$  5·8; of  $p^4$  7·5,  $m^1$  8·6,  $m^2$  5·9.

*Type.* The specimen above recorded. B.M. No. 2.9.9.6.

This fine Mongoose is of about the same size as the true Cape *Herpestes galera*, though with smaller teeth, the large *H. galera robustus* of East Africa and the Upper Nile separating the two. No Mongoose of this group appears to have been hitherto recorded from Abyssinia.

9. *ICTONYX*, sp. inc.

♀. Addis Ababa, 8000 feet. 26 March.

10. *LUTRA CAPENSIS MENELEKI*, subsp. n.

♂. Zegi, Lake Tsana, 4000 feet.

The Abyssinian representative of the Cape Clawless Otter.

Size very large; colour very strong and dark, deep chocolate-brown on the back, darkening anteriorly almost to black on the nape and crown, where it is indistinctly grizzled with white. Muzzle greyish white. Lips, cheek, and sides of neck sharply contrasted white. Ears brown, with prominently white edges. Chin and throat dull yellowish white; belly brown, little paler than the upper surface. Limbs and tail dark brown as usual.

Underfur of body all over, and notably of back, silvery white, the extreme tips only of the hairs brown. In true *L. capensis* the underfur is almost entirely brown.

Skull very broad and massive, larger and heavier in every way than a fine adult male skull from West Africa. Interorbital,

postorbital, and mastoid breadths all greater than in the allied skull, but the height of the skull scarcely greater, so that its flattened shape is unusually marked even for this group. Nasal opening broader than high, the converse being the case in the other forms. Pterygoid processes larger than in the West-African form, bullæ lower and flatter, mastoid and paroccipital processes larger, the last-named more distant from the condyles (10 instead of 6 mm.). These comparisons are all made with a skull distinctly older than the typical skull of the new form.

Dentition apparently quite as in true *L. capensis*.

Dimensions of the type (measured in skin):—

Head and body 900 mm.; tail 670; hind foot —; ear 25.

Skull—basal length 131; zygomatic breadth 106; mastoid breadth 102; interorbital breadth 35; tip to tip of interorbital processes 51; intertemporal breadth 28·5; palate length exclusive of median spine 66·5; breadth of posterior palate 16·5. Greatest diameter of *m*<sup>1</sup> 19·5.

*Type.* B.M. No. 2.9.9.13.

This magnificent Otter, which I have named in honour of His Majesty the Emperor Menelek, represents in Abyssinia the clawless species, *L. capensis*, of Southern and Western Africa, just as Herr Oscar Neumann's *L. concolor*, from Addis Ababa, represents the clawed one, *L. maculicollis*. Whether it is confined to Lake Tsana, or ranges into the rivers surrounding the slopes of the high grounds, remains to be proved.

As a subspecies it is recognizable by its broad low skull, broad nasal opening, dark colour, and silvery underfur.

It is possibly to this large Otter that Heuglin's references<sup>1</sup> to a Tsana Manatee are traceable, for the Otters which he mentions as such<sup>2</sup> are quite small ones—"Kaum die Grösse der Genet-Katze," and native accounts of this large form might have led him to believe that the "Aila" or "Auli" was "wohl ein Manatus?"

# 11. SCIURUS MULTICOLOR Rüpp.

♂ ♂ ♀. Zegi, Lake Tsana, 4500 feet. 14–22 May.

The female has 1–2 = 6 mammae.

# 12. XERUS RUTILUS Cretzschm.

♀. Gildessa, Somali.

As Mr. de Winton has shown<sup>3</sup>, the names *X. dabagalla* Heugl. and *X. flavus* M.-Edw. are synonymous with *X. rutilus*, while the darker, more northern form should stand as *X. brachyotus* Hempr. & Ehr. (syn. *X. fuscus* Huet).

# 13. TATERA, sp. (probably *murina* Sund.).

♂. Lake Zuai. 10 March.

<sup>1</sup> Reise N.O.-Afr. ii. p. 137 (1877).

<sup>2</sup> *T. c.* p. 39.

<sup>3</sup> P. Z. S. 1898, p. 765.

## 14. OTOMYS DEGENI, sp. n.

♂ (skin). Gombitchu, Shoa, 8000 feet. 16 April. *Type*.

2 ♀ (in spirit). Moncorar, Mietcha, Godjam, 9000 feet.

One deep and one shallow groove in each upper, and two deep grooves in each lower incisor. Lamina formula of molars  $\frac{3-2-8}{4-2-2}$ .

Fur comparatively thin and poor, very different from the deep rich fur of *O. jacksoni*; shorter hairs of back about 13 mm. in length. General colour strongly lined pale brown, between raw umber and isabella of Ridgway, without marked metallic sheen. Sides rather more buffy. Under surface but little lighter, the hairs broadly slaty basally, dull buffy terminally. Head like body, inconspicuous yellowish patches above and below eye and round ear. Backs of ears brown, edges and inner surfaces yellowish. Hands and feet dull greyish. Tail brown above, dull greyish on sides and below.

Skull large and heavily built, conspicuously stouter than in *O. jacksoni*. Nasals very broad, as much expanded in front as in *O. irroratus*. Posterior palate ending about level with the sixth lamina of  $m^3$ .

Incisors very broad, the upper ones with one deep sharp groove dividing off the outer third of the tooth, and the front of the inner part faintly and indistinctly concave. On the extreme inner angle of the tooth there is also a third minute shallow and almost imperceptible groove. Lower incisors with two deep and equal grooves, dividing each tooth into three equal portions. Molars broad; the posterior one above with eight laminae, the anterior lower with four.

Dimensions of a female specimen in spirit, not the type:—

Head and body 161 mm.; tail 90; hind foot (s. u.) 28.5; ear 22 × 21.

Skull of type—upper length from back of interparietal 36.2; greatest breadth 19.7; nasals 16.5 × 7.5; interorbital breadth 4.4; interparietal 4.7 × 9; diastema 9; palate length 17.8; palatal foramina 7.3; length of upper molar series (crowns) 8.2.

This *Otomys* might have been supposed to be Heuglin's "*Oreomys typus*,"<sup>1</sup> described from the mountains of Simien, but that animal is distinctly said to have three sharp and deep grooves on both the upper and lower incisors, so that *O. degeni*, with two deep ones below and one deep and two indistinct ones above, can hardly be the same, whatever allowance for error ought to be made.

*O. jacksoni* Thos., from Mt. Elgon, is otherwise the nearest species, and that is smaller, with a more delicately built skull, with only 7 laminae in  $m^3$ , and, though the number of the incisor grooves is practically the same, their spacing is different. Externally *O. jacksoni* is a much darker-coloured and thicker-furred animal.

<sup>1</sup> Reise N.O.-Afr. ii. p. 76 (1877). Since the above was written, Dr. K. Lampert of Stuttgart has kindly sent me some further particulars about the typical skull of *O. typus*, which conclusively prove that *O. degeni* is distinct from it.



I have much pleasure in naming this distinct species after Mr. Degen, the collector of the present interesting series.

15. *MUS ALBIPES* Rüpp.

2 ♂, 1 ♀. Addis Ababa. March, April.

This species is readily distinguished by its long tail from the other members of the group. Mr. Pease also obtained two specimens of it at Lake Zuai.

16. *MUS* spp.

3 ♂, 3 ♀. Addis Ababa. February to March.

2 ♂. Hawash R. March.

♂. Gubre, Godjam, 6000 feet. 9 May.

♂. Abulie, Kutai. June.

Besides the long-tailed, long-skulled *M. albipes*, there appear to be more than one species of the difficult *macrolepis-lateralis* group in the collection, but without further material, with flesh-measurements, it is impossible to distinguish them or make out what names they should bear. Several of Heuglin's names appear to belong to this group.

17. *LEGGADA MAHOMET* Rhoads.

♂. Addis Ababa. 5 April.

18. *ARVICANTHIS ABYSSINICUS* Rüpp.

♂ ♀. Addis Ababa. March.

♂ ♀. Yah-Yah, Shoa. April.

4 ♂. Lake Tsana. May and June.

♂ ♀. Hawash R. February and March.

♀. Lake Zuai. March.

For all these Abyssinian *Arvicanthes* I provisionally use Rüppell's name of *abyssinicus*, with typical specimens of which some of them entirely agree. But on the one hand there may be more than one definable form among them, and on the other identification has to be made of quite a number of other names which have been given to members of the group. Thus *Meriones lacernatus* Rüpp. and *Mus ochropus* and *M. rufidorsalis* Heugl. are all evidently forms of *Arvicanthis*, and will have to be identified when further material is available. But the North Somali *Arvicanthis*, which has been identified with the East-African *A. neumanni* Matsch., is clearly distinct and is now described<sup>1</sup>.

<sup>1</sup> *ARVICANTHIS SOMALICUS*, sp. n.

A small pale species allied to *A. neumanni*.

Size markedly less than in the other members of the group. General colour pale sandy buff lined with brown, becoming more "pinkish buff" on the rump. No trace of a spinal dark line. Head paler, almost whitish, eye-rings and ears sandy fulvous. Under surface dull whitish, the hairs dark basally. Upper surface of hands and feet buffy white. Tail blackish above, dull fulvous on the sides and below.

Skull small, strongly built, with strongly-ridged supraorbital region.



19. *PELOMYS HARRINGTONI*, sp. n.

♂. Katchisa, Kutai, W. Shoa. 23 June.

General appearance of *P. dembeensis* above, but belly with three bright buffy lines.

Size about as in *P. dembeensis*, smaller than in *P. fallax*. Fur rather crisp; general hairs of back about 12 mm. in length, the longer hairs overtopping them by about 5–6 mm. General colour dark lined olivaceous, more distinctly greenish than in *P. fallax*. Sides paler, more fulvous and more heavily lined. Under surface white (the hairs white nearly to their roots), with three bright buffy yellow lines running down it, one median on the chest and upper belly, and two lateral, bordering the dark colour of the sides the whole length of the animal, from the upper lip down the neck, body, and front of hind limbs to the ankles. Head like body, indistinct yellowish spots above and below eyes. Ears brown, their basal hairs yellowish. Fore limbs grizzled olive externally, darkening to brown on the hands; white on the inner surface. Hind legs olive externally, white edged with yellow internally; feet grizzled fulvous and brown. Tail thinly haired, blackish above, dull yellowish below.

Skull comparatively small and slender; interorbital region narrow, finely beaded. Palatal foramina well open, not markedly narrowed posteriorly, their hinder end level with the anterior root of  $m^1$ ; posterior edge of palate level with the middle of  $m^3$ .

Incisors narrower than in *P. fallax* and much less distinctly grooved, the groove in fact almost obsolete. Molars smaller and more delicate than in *P. fallax*, but with the same essential distinctions from those of *Golunda*. Inner tubercle of each lamina throughout larger, and middle one smaller than in *P. fallax*, so that the inner one is about three-fourths the size of the middle one or more, while in *P. fallax* the middle tubercle is always twice the breadth of the inner one.

Dimensions of the type, taken on the skin:—

Head and body 140 mm.; tail 90+— (imperfect); hind foot (s. u.) (wet) 27·3; ear (dry) 15.

Skull—tip of nasals to back of frontals 25; greatest breadth 14·5; nasals 12·5 × 3·8; interorbital breadth 4·1; palate length from henselion 13·3; diastema 8·5; palatal foramina 6·6 × 2·2; length of upper molar series 6.

Type. ♂. B. M. No. 2.9.9.36.

The only described species allied to *P. harringtoni* is Rüppell's *Mus dembeensis*, considered by Mr. de Winton<sup>1</sup> (although with

Dimensions of the type (measured in the flesh):—

Head and body 133 mm.; tail 104; hind foot (s. u.) 23; ear 16.

Skull—greatest length 30; basilar length 26; greatest breadth 16; interorbital breadth 5; length of upper molar series 5·9.

Hab. Northern Somali-land. Type from Shuk, alt. 4000 feet.

Type. Old male. B. M. No. 97.12.3.9. Collected and presented by E. Lort Phillips, Esq. Many specimens examined.

<sup>1</sup> P. Z. S. 1901, p. 81.

remarks on its molar differences) as an *Arvicanthis*, but which I think is also more nearly allied to *Pelomys*. From that species *P. harringtoni* differs by its striped belly and smaller molars.

I have named this handsome and remarkable species, which is distinguished from all its allies by the brilliant striping of its under surface, in honour of Col. Harrington, the British Resident at Addis Ababa, to whose assistance all British travellers in Abyssinia are so much indebted.

With regard to the use of the name *Pelomys*, a genus of recent years synonymized with the Indian *Golunda*, I have come to the conclusion that after all the two forms may well be considered as generically distinct. Like as they are in external characters, and in skull and incisor structure, the molars of the two groups show such differences in detail that, combined with the different geographical distribution, I think it would be best to keep them apart. While the molars of *Pelomys* are of fairly normal murine structure, with subequal anterior accessory tubercles,  $m^2$  and  $m^3$  of *Golunda* have their antero-internal tubercles hypertrophied and their antero-external ones minute or obsolete, so as to give a peculiar oblique appearance to the teeth. In outline the latter are also broader, shorter, and less narrowed posteriorly. The teeth of *Golunda* have been well figured by Blanford<sup>1</sup> and those of *Pelomys* by Peters<sup>2</sup>.

Even after the removal of *Golunda* it is by no means certain that *Pelomys dombeensis* and *P. harringtoni*, with their almost ungrooved incisors, ought to be considered as congeneric with *P. fallax*, but I do not care to separate them without seeing what representative forms occur in the intermediate countries.

## 20. *LOPHUROMYS FLAVOPUNCTATUS* Thos.

2 ♂, 2 ♀. Addis Ababa, 8000 feet. February and March.  
♂. Yah-Yah, Shoa. 18 April.

The type of this species, which was discovered by Sir W. C. Harris during his Mission to Shoa in 1843, was probably obtained at Ankober, about 100 miles N.E. of Addis Ababa.

As is usual in this genus, the bellies of these specimens vary considerably in the intensity of their yellowish suffusion, the two females being the most strongly coloured. The upper surfaces are also by no means uniform in tone.

## 21. *MURICULUS IMBERBIS* Rüpp.

o. Zige, Lake Tsana, 4000 feet. 1 June.

### *MURICULUS*, gen. nov.

Size very small; proportions about as in *Lophuromys*. Hind feet with the fifth digit short, though not quite so short as the hallux. Claws small, not markedly elongated.

<sup>1</sup> Mamm. Ind. p. 427 (1891).

<sup>2</sup> Reise Mossamb., Mamm. pl. xxxv. fig. 9 (1852).

Fur thick, close, and rather crisp, some of the hairs flattened, though not to be called spiny. Back lineated in the type species. Tail short, closely but finely hairy.

Skull stoutly built, rather like that of a small short-headed *Lophuromys*. Palatal foramina very long; posterior palate continued some way backward behind molars. Incisors narrow, smooth in front, markedly thrown forwards, so that even the tips of the upper ones do not curve backwards towards the throat. Molars strictly murine, without any marked characteristics.  $m^2$  and  $m^3$  each with a large antero-internal accessory cusp, and the former only with a small antero-external one.

Type. *Mus imberbis* Rüpp.

Some years ago, by the kindness of the authorities of the Senckenberg Museum, I had the opportunity of examining the type of Rüppell's *Mus imberbis*, and saw at once that it could not be assigned to any known genus. Now that a specimen has been secured by Mr. Degen I venture to give it a generic name.

In a general way *Muriculus imberbis* looks like a pigmy *Aricanthis* or *Lophuromys*, and, while clearly not assignable to any known genus, is somewhat lacking in definitive generic characters, its projecting incisors being its most marked feature. Its whiskers are as abundant as usual, Rüppell's specimen having no doubt lost them accidentally, and it has a distinct dorsal black stripe down the posterior half of the spine. This stripe is not mentioned by Rüppell, but is present in the type, as I have personally noted.

In some ways this is the most interesting of Mr. Degen's captures, and fills an important lacuna in the National Collection of Muridæ.

22. PECTINATOR SPEKEI Blyth.

o. Las Mahan, Somali.

23. LEPUS, sp. inc.

♂. Marmasa, N.E. of Mt. Asebot. 25 January.

o. Miessa, S. of Mt. Asebot. 23 July.

Long-eared Desert Hares of the *L. æthiopicus* type, not satisfactorily determinable without further material.

24. LEPUS FAGANI, sp. n.

♂. Zegi, Lake Tsana, 4000 feet. 28 May.

"In scrub."—E. D.

A remarkably dark-coloured Hare, quite unlike any of the pale N. African species.

Size medium. General colour very dark for an African Hare, the general tone of the back approaching Ridgway's "mummy-brown"; the underfur with pale slaty greyish bases and buffy tips, the long hairs light for their basal and black for their

terminal halves, with a buffy or dark isabelline subterminal band. Under surface mostly dull sandy or buffy, with but little white; not sharply defined from the upper surface. Crown of head grizzled mummy-brown, like back, a large area round each eye whitish buffy. Ears of only medium length, their outer surface dark grizzled brown, with an inconspicuous patch of dull black behind their tips; fringe of long hairs on lower part of anterior edge, of shorter hairs along the posterior edge, dull sandy; inner surface brown proximally, sandy terminally. Nape-patch rather paler than "cinnamon-rufous." Fore limbs like nape-patch at elbows, becoming sandy buffy on the hands; feet also dull sandy buffy. Tail unfortunately wanting in the only specimen.

Skull stoutly built, with a long heavy muzzle; supraorbital wings unusually small and weak; anterior shoulders of zygomata large and prominent, the breadth across them exceeding the posterior zygomatic breadth; palatal bridge of medium breadth; bullæ decidedly small.

Upper incisors each with a deep but simple enamel indentation, corresponding about to no. xiii. of the series figured by Dr. Major<sup>1</sup>; the groove entirely filled up with cement.

Dimensions of the type, measured in skin:—

Head and body 510 mm.; hind foot 102; ear-opening (wet) 90.

Skull—greatest length 90·5; basilar length 68·8; zygomatic breadth 40·3; nasals, length diagonally 41, breadth 20; inter-orbital breadth 21, breadth across supraorbital wings 21·7; intertemporal breadth 10·7; palatal foramina  $22 \times 8\cdot5$ ; palatal bridge 7·4; antero-posterior diameter of bullæ 10·2.

*Type.* The specimen recorded above. B. M. No. 2.9.9.54.

This very interesting Hare differs widely from all the pale long-eared N. African Desert Hares, and is apparently the representative in Abyssinia of the *L. whytei* group of Nyasa and Central Africa, with which it somewhat agrees in cranial characters and in the proportions of its ears.

I have named it in honour of my friend, Mr. Charles E. Fagan, Assistant Secretary of the Museum, to whom Mr. Degen, like all other collectors making expeditions for the benefit of the National Museum, has been much indebted for assistance.

## 25. *PROCAVIA BRUCEI SOMALICA* Thos.

Adult ♂ & young. Bijo. 16 January.

## 26. *ORYCTEROPUS AFER ÆTHIOPICUS* Sund.

Andota. May.

<sup>1</sup> Trans. Linn. Soc., 2nd ser. Zool. vii. p. 468 (1899).



5. Note on *Alces bedfordiae*.

By Hon. WALTER ROTHSCHILD, M.P., F.Z.S.

[Received July 1, 1902.]

At the scientific meeting of this Society on June 17th a communication was read from Mr. H. J. Elwes, taking to task Mr. Lydekker for describing a new Elk from insufficient material (see P. Z. S. 1902, vol. ii. p. 104). I wish to point out to the Society that the characters by which species and subspecies of vertebrate animals are distinguished are much more constant as a rule than those of the Invertebrata, the study of which probably induced Mr. Elwes to make this communication. Therefore Mr. Lydekker, to my mind, was justified in describing *Alces bedfordiae*, though I personally would only have given the new form subspecific rank. In support of the validity of this new Elk, I may say I knew of its existence eight years before Mr. Lydekker described it. I have in the Tring Museum a good series of this form in addition to the two types. Mr. Carl Hagenbeck has received considerable numbers of these horns, and many pairs have passed through the London horn- and feather-merchants' hands, which, being of the same type, prove the recently described form to be fully worthy of a name.

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November 18, 1902.

Prof. G. B. HOWES, D.Sc., LL.D., F.R.S., Vice-President,  
in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of October 1902:—

The registered additions to the Society's Menagerie during the month of October were 169 in number. Of these 66 were acquired by presentation and 1 by purchase, 89 were received on deposit, and 13 in exchange. The total number of departures during the same period, by death and removals, was 140.

Amongst these special attention may be drawn to:—

1. A specimen of the Galapagan Barn-Owl (*Strix punctatissima*), deposited Oct. 11th, probably the first example of this rare Owl that has reached Europe alive.

2. Seven living examples of the Galapagan Land-Iguana (*Conolophus subcristatus*) from Seymour Island, Galapagos, deposited Oct. 11th.

The Barn-Owl and Iguanas were brought from the Galapagos along with a collection of Gigantic Tortoises, and deposited by the Hon. Walter Rothschild, M.P., F.Z.S.

3. A specimen of the Fringed Gecko (*Uroplates fimbriatus*) from Madagascar, deposited Oct. 25th by the Hon. Walter Rothschild, M.P., F.Z.S.

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Dr. Henry Woodward, F.R.S., exhibited photographs of two Stags' heads and read the following extract from a letter written concerning them by Mr. D. Russell, Hon. Sec. of the Otago Acclimatization Society:—"The stag-heads will give you an idea of how the Red Deer of Europe (*Cervus elaphus*) thrive here. The herd that these heads are from numbers from four to five thousand, and has resulted from the turning out of six hinds and two stags in 1868. Of course, the country is in every way suitable for them, and they have lots of room in front of them to populate. Some of the carcasses weigh from five to six hundred pounds. There are similar herds in several other parts of New Zealand as well as in our district."

Dr. Woodward also read the following abstract from the Annual Report of the Otago Acclimatization Society for the season ending March 31, 1902, on the same subject:—"The herd of Red Deer on the Morven Hills and adjacent districts is doing remarkably well. We are much indebted to Mr. C. Turnbull for a very valuable report on the herd from personal observations made by him in April of this year. Mr. Turnbull informs us that the deer have greatly increased in numbers and spread far afield since he saw them last some seven years ago, and that the food in the Deer-country has greatly improved of late years owing to the rabbits being much less numerous than formerly. Mr. A. E. Leatham, a visitor from the Home country, has also kindly sent to the Council a report on the deer in the Hunter Valley. Mr. Leatham spent a month in the district, and found deer fairly numerous in all the valleys running into the Hunter Valley, some of the valleys being ten and twelve miles long. Thirty miles up the Hunter Valley, Mr. Leatham shot stags, and observed their tracks going still further afield. The outer fringes of the herd will now probably be on the slopes of the West Coast, where they will have unlimited scope to spread unmolested, and will afford good deer-stalking for any number of sportsmen in the future. Owing to the mild winter and early spring the stags this season were in fine condition and carried good antlers. Several were shot with carcasses weighing from five to six hundred pounds each, and quite a number of the heads obtained had antlers from 40 to 46 inches long from tip to base, with a width of span up to 41 inches. Mr. Quin, of Tapanui, procured this year four young hinds and two stags from Mr. Chirnside of Victoria. These have been put down on the upper reaches of the Pomahaka River, where the country is suitable for their requirements."

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Mr. J. L. Bonhote exhibited and made some remarks on four hybrid Ducks which he had bred in his aviaries during the past summer. The first specimen exhibited was that of a cross between the Indian Spot-billed (*Anas pectorhynga*) and the Wild Duck (*A. boschas*), the male parent being a hybrid between these two species, and the female a pure-bred Wild Duck. The remaining three specimens from two broods represented a cross

between three species, viz., the Indian Spot-billed, the Wild Duck, and the Pintail (*Dafila acuta*); in each case both the parents being hybrids. In one instance the drake was a Spot-billed Mallard, and the duck a Pintail Mallard, and in the second instance the sexes were reversed.

In pointing out in what manner these crosses partook of their parent forms, Mr. Bonhote drew attention to the fact of the great tendency they showed to become white on the underparts, which he was inclined to believe was a sign of reversion to an earlier form, having regard to the numerous species of water-birds in which light-coloured underparts were a constant feature.

A water-colour drawing of a male Spot-billed and Mallard hybrid in eclipse plumage was also shown; and it was pointed out that in the winter plumage this individual closely resembled the Mallard, while in the eclipse plumage it showed greater evidence of the other parent.

Mr. Bonhote drew the following conclusions from his experiments, so far as they had at present been carried:—

- (i) Hybridism between three species of surface-feeding Ducks is comparatively easy of attainment; hybrids between two species showing no evidence of sterility.
- (ii) There is a marked tendency in the produce towards white underparts.
- (iii) So far as can be judged, the Pintail is slightly dominant over the Mallard, and the Mallard over the Spot-bill.
- (iv) The chestnut breast and spotted bill are the most dominant features of their respective species.
- (v) In a hybrid one species may be dominant in the winter plumage, and the other parent in the eclipse plumage.

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Mr. Oldfield Thomas exhibited a mounted male, and a female skull of the East African representative of the Bongo Antelope, recently described by him as *Boocercus euryceros isaaci*<sup>1</sup> on these specimens, which had been obtained by Mr. F. W. Isaac in the deep forest of the Eldoma Ravine, British E. Africa, and presented by him to the National Museum.

Mr. Thomas drew special attention to the horns of the female, which, in proportion to the size of the animal, were longer than those of the male. The measurements had been given in the paper describing the subspecies.

This was no doubt the animal to which reference had been made by Mr. F. J. Jackson in a letter read before the Society in 1897<sup>2</sup>, when the horns of a female were exhibited at the Meeting and figured in the 'Proceedings,' although at that date the native statement that they belonged to a female was not credited, and they were supposed to be those of a male Bushbuck allied to the Inyala (*Tragelaphus angasi*).

<sup>1</sup> Ann. Mag. N. H. (7) x. p. 310 (1902).

<sup>2</sup> P. Z. S. 1897, p. 455.

No other member of the *Tragelaphinae*, except the Eland, had horns in the female; and it was on this character that it was thought that the Bongo should constitute a genus—*Boocercus*<sup>1</sup>—distinct from *Tragelaphus*, in which the females were hornless.

It still remained to be verified that the true Bongo of West Africa had also horns in the female, no members of that sex having as yet come to Europe. But the males from the two localities were so similar that it seemed highly improbable that the females should differ in so important a character.

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Mr. O. Thomas, F.R.S., exhibited, on behalf of Mr. Lydekker (who was unable to attend), the mounted skin of an adult male of the Peking Deer (*Cervus* [*Pseudaxis*] *hortulorum*), recently presented by the President and the Duchess of Bedford to the British Museum. Mr. Lydekker believed that an adult specimen of this fine stag had not hitherto been figured, and he therefore thought that a figure of the example now exhibited would be desirable in the Society's 'Proceedings.' The specimen was in the summer dress.

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Dr. A. Smith Woodward, F.R.S., gave an account of some excavations for the discovery of early Pliocene mammalian remains which he had recently made near Concud, in the province of Teruel, Spain. The bones had proved to be very abundant in a bed of freshwater marl, but they were in a much more fragmentary condition than those found at Pikermi, in Greece. He had discovered evidence of the former existence of species of the genera *Hipparion*, *Rhinoceros*, and *Mastodon*, and of several small antelopes, and exhibited some jaws of the first of these genera.

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Mr. F. E. Beddard, F.R.S., remarked as follows upon the birth of an Indian Elephant in the Society's Gardens:—

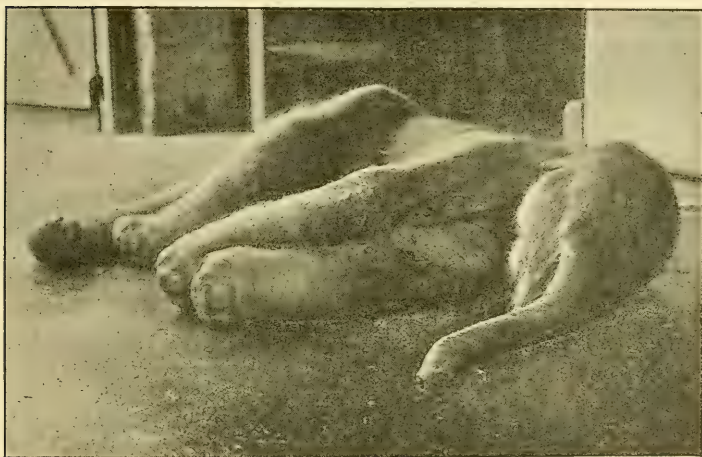
The birth of an Elephant in a menagerie is so rare an event that some notice of the circumstances attending the birth of an Indian Elephant in the Society's Gardens in August last may prove acceptable to the Fellows. During the history of the Society there has been no other instance of an Elephant having been born in the Gardens; and in other menageries such occurrences are extremely rare. A note in the 'Field' newspaper of Oct. 25th last sums up the few births in menageries which have been recorded, and they are only two. The Elephant, which has lately given birth to a calf, was deposited in the Gardens on Sept. 19th, 1901, by Messrs. John Sanger & Sons. The Elephant was believed to be in young; but the exact date of impregnation was not known. There were reasons for believing that this took place in April 1900, and in that case the birth might have been expected to have occurred in January or February 1902. Mr. Arthur Thomson, the Society's Assistant Superintendent, reports

<sup>1</sup> *Euryceros* Gray nec Lesson.

that he examined the mother before she reached the Society's Gardens, and noticed some swelling of the breasts, but no other signs of approaching maternity. During the stay of the animal in the Gardens no further increase of size in the mammae was observable; and, as there was no apparent increase of bulk in the abdominal region, the idea of pregnancy was abandoned. Dr. Thomas Stevens, of Guy's Hospital, was so good as to examine the animal; but he was unable to detect any obvious signs of pregnancy. However, on Sunday morning, the 31st of August, the animal produced a calf, the exact circumstances concerning the birth of which I subjoin from Mr. Thomson's report upon the matter:—

“On my arrival at the Elephant-house about 9.15 I stopped to look at the Elephant. I could see at once by the way she was walking about the den, sometimes forward and sometimes backward, and every now and then stooping with her hind legs and

Text-fig. 60.



Newly-born dead Indian Elephant, ♀.

(From a photograph by Mr. W. P. Dando, F.Z.S.)

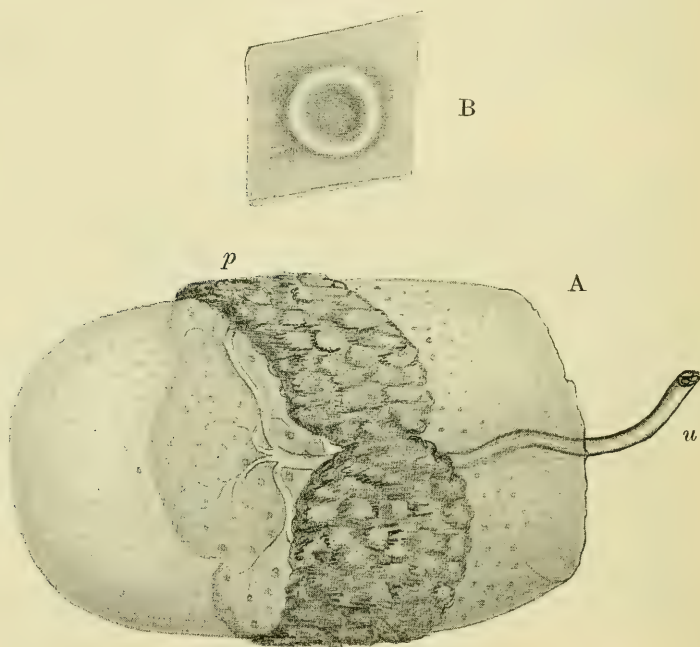
straining very much, that a young Elephant would soon be born. The keepers had all gone (as is usual on Sunday mornings), and I left the house to seek assistance and to send for the keepers. On my return about 9.45 A.M. the young Elephant had been born, and was lying dead in the middle of the den. I had the mother chained up, and then with the greatest care removed the dead animal, with the placenta, just as I found it, to the dead-house. The mother was very quiet, and did not in any way



attempt to interfere with the keepers whilst they were removing the dead young one."

Mr. Thomson came at once to my house and informed me of the fact. Unfortunately it was Sunday, and my assistant was away upon his annual holiday. I was therefore obliged to abandon the idea of taking out the fresh brain, which would have been of the greatest use. Mr. Thomson made the useful suggestion that the young animal should be photographed, and Mr. Dando, F.Z.S., accordingly took an excellent photograph of it, which is exhibited herewith (text-fig. 60, p. 321). I

Text-fig. 61.



Placenta of newly-born Indian Elephant, ♀.

A. General view of placenta (*p*) and membranes; *u*, umbilical cord.

B. "Subcircular body."

communicated with Dr. Stevens, who kindly came up to my laboratory, and we together examined the placenta, and also ascertained that the calf had been born dead; that it had never breathed was shown by the absence of air in the lungs, which sank in water. The measurements of the calf were as follows:—From front of forehead to root of tail 3 ft. 9 in.; height at centre of back 2 ft. 11 in.; angle of mouth to tip of trunk







J. Smit del. et lith.

CAPRA FALCONERI MEGACEROS.

Mintern. Bros. imp.

1 ft. 10 in.; circumference of fore foot 1 ft. 8 in. The calf was a female, and the most noticeable external characteristic was the large amount of hair upon the body, particularly upon the limbs. The macroscopic features of the Elephant's placenta are known; but the following notes with which Dr. Stevens has furnished me are of value, since the opportunities of studying this organ have not been many:—

1. It is typically *zonary*, consisting of a belt of placental structure, approximately 10 inches in breadth on an average. Some parts were wider than others, and in places, being torn, there was a difficulty of estimation. The belt was divided into three chief masses as shown in the rough diagram (see text-fig. 61, A, p. 322). The greatest thickness of the placental tissue was  $1\frac{1}{2}$  inches.

2. The placental tissue was somewhat broken up into cotyledons, as one finds in the human placenta.

3. The cord, 40 inches long, was inserted mainly into one placental mass, and from this point large vessels radiated under the amnion to the other placental masses.

4. There were two arteries and one vein in the umbilical cord. No obvious Wharton's jelly was present, only a dense connective tissue around the vessels and not much of that.

5. The membranes were torn at one end, where the fœtus escaped, but the other end of the amniotic cylinder was intact.

6. Scattered all over the membranes and in the substance of the amnion were the "subcircular bodies" (*Owen*) (text-fig. 61, B, p. 322)—most numerous near the placenta, least so at the extremities of the amniotic cylinder. These bodies are somewhat like buttons in appearance, with an elevated rim and a depressed centre. Microscopically they consist of fibrous tissue devoid of structure, and showing no nuclei or cellular contents.

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The following papers were read:—

### 1. Note on the Markhor of Cabul. By R. LYDEKKER.

[Received October 10, 1902.]

(Plate XXVII.)

In my work entitled the 'Wild Oxen, Sheep, and Goats of All Lands,' I was unable to give any description of the Cabul race of the Markhor (*Capra falconeri megaceros*), save such as may be gathered from the skull and horns, for the very sufficient reason that I had never seen any other part of the animal. Recently the British Museum has acquired the skin, in the winter coat, of a remarkably fine male of this race, shot by a British officer in Chitral. The horns are essentially those of the Cabul race, being intermediate in form between the Pir-Panjal

and the Suleman types. In size the animal is fully equal to the typical Astor race of the species. The general colour is, however, decidedly darker, the tips of the hairs being blackish brown instead of a kind of blotting-paper colour. The throat-fringe seems also to be somewhat darker; and the under-parts show a decided difference from those of the Astor race, being at least as dark as, if not actually darker than, the back, instead of distinctly lighter. The resemblance between the two animals is, however, so close as to indicate without doubt that they are races rather than species.

It may be worth mention that the rocks of Chitral are gneiss, and these present a spotted black-and-white coloration very similar to that of the Cabul race of the Markhor, the name Chitra' itself not improbably being derived from these spotted rocks.

2. Second Account of the Fishes collected by Dr. W. J. Ansonge in the Niger Delta. By G. A. BOULENGER, F.R.S., V.P.Z.S.

[Received October 15, 1902.]

(Plates XXVIII. & XXIX.<sup>1</sup>)

In January 1901<sup>2</sup> I had the honour of reporting on a small collection of freshwater fishes made by Dr. Ansonge in Southern Nigeria. Small as it was, that collection proved to be of considerable interest, six species being new and one deserving to become the type of a new family (Phractolæmidæ). Encouraged by these results, Dr. Ansonge has continued to collect in the same district, and has enabled me to draw up the following list of 56 species not represented in his former collection; these, added to the 24 species enumerated in the previous list, make a total of 80. Four species are now described as new.

As on the previous occasion, the difficulty of procuring spirit in sufficient quantity has prevented Dr. Ansonge from preserving any but small specimens. The fishes here enumerated are either small species or are represented merely by young specimens. In the case of the *Polypteri*, which have already been described in these 'Proceedings',<sup>3</sup> there was no occasion to regret the course imposed on Dr. Ansonge by the circumstances.

POLYPTERIDÆ.

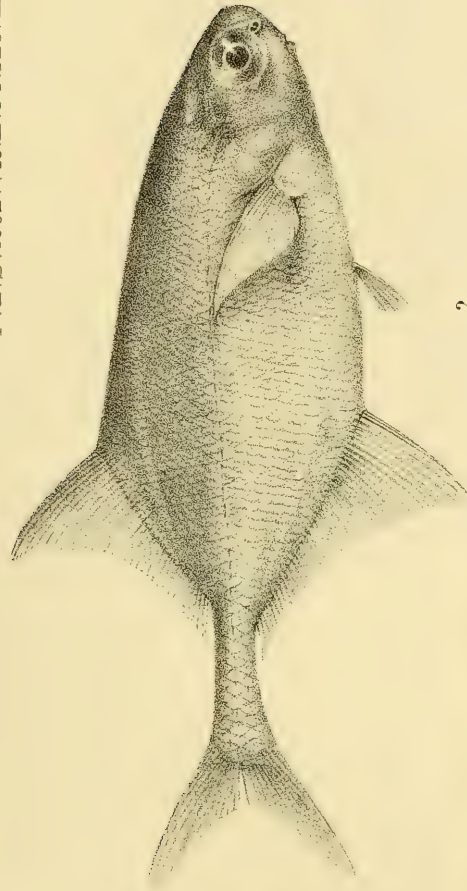
1. POLYPTERUS LAPRADII Stdr.—Assay.
2. POLYPTERUS ENDLICHERI Heck.—Abo.

<sup>1</sup> For explanation of the Plates, see p. 330.

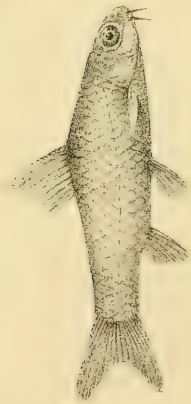
<sup>2</sup> P. Z. S. 1901, i. p. 4.

<sup>3</sup> P. Z. S. 1902, i. p. 121.

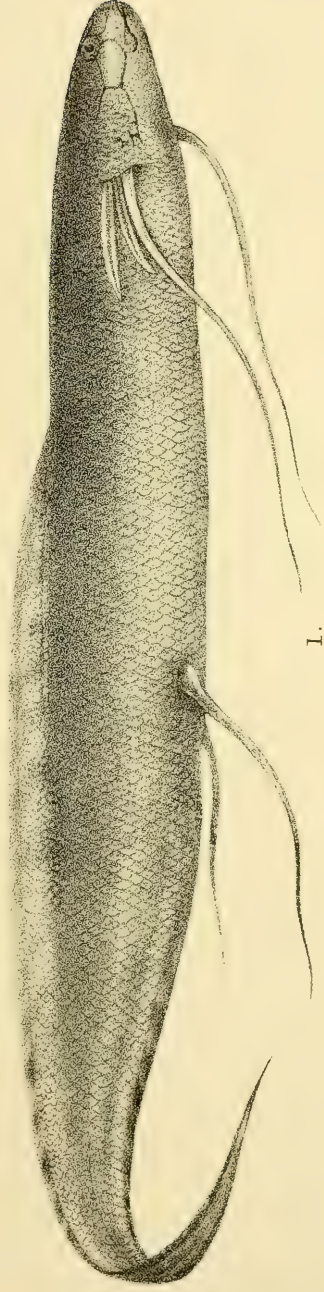




2.



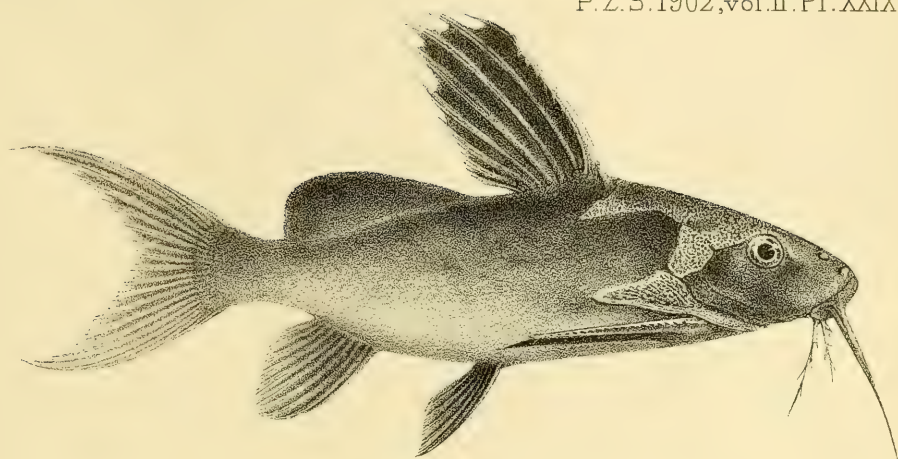
3.



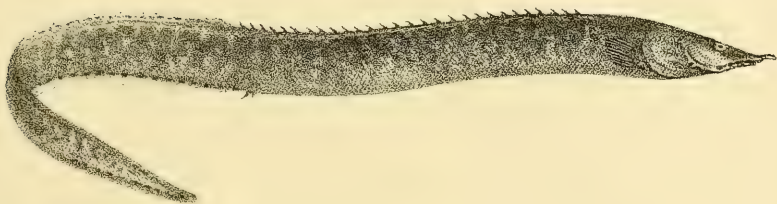
1.



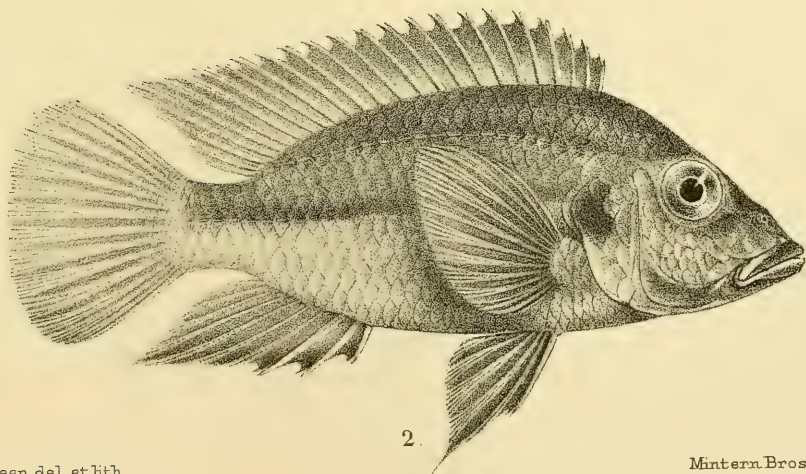




1.



3.



2.

J.Green del.et lith.

Mintern Bros imp

1.SYNODONTIS MELANOPTERUS. 2.PELMATOCHROMIS PELLEGRINI.  
3.MASTACEMBELUS LOENNBERGI.



## 3. POLYPTERUS SENEGALUS Cuv.—Assay, Abo.

The young specimens of these three species obtained by Dr. Ansorge have been described and figured in P. Z. S. 1902, i. p. 4, pls. x. & xi.

## LEPIDOSIRENIDÆ.

## 4. PROTOPTERUS ANNECTENS Owen. (Plate XXVIII. fig. 1.)

Three young specimens, 160 to 215 millim. long. The limbs are longer than in specimens of *P. æthiopicus* and *P. dolloi* of corresponding size, the fore limb extending to the vent, or beyond. Head  $3\frac{2}{3}$  to 4 times in distance from end of snout to vent; eye 7 to 8 times in length of head,  $1\frac{2}{3}$  to 2 in interorbital width. 50 scales in a longitudinal series from gill-opening to vent, 38 round the middle of the body. The longest external gills measure  $\frac{2}{3}$  the length of the head. Vent on the left side in two specimens, on the right in the third.

The following are the measurements of the largest specimen :—

Total length 215 millim.; head 24; head to vent 70; head to origin of dorsal 30; fore limb 80; hind limb 56.

## MORMYRIDÆ.

## 5. MORMYROPS DELICIOSUS Leach.—Agberi, Assay.

## 6. PETROCEPHALUS SIMUS Sauv.—Agberi.

## 7. PETROCEPHALUS ANSORGII, sp. n. (Plate XXVIII. fig. 2.)

Depth of body 3 times in total length, length of head  $4\frac{1}{3}$ . Head slightly longer than deep; snout rounded,  $\frac{1}{6}$  length of head; mouth situated below the eye, its width  $\frac{1}{5}$  length of head; teeth bicuspid, 10 in the upper jaw, 20 in the lower; nostrils close together, close to the eye, a little above the level of its lower border; eye large, twice as long as the snout,  $1\frac{1}{3}$  interorbital width. Dorsal 33, originating above 9th ray of anal, its length  $1\frac{1}{2}$  in its distance from head. Anal 39, equally distant from base of ventral and from base of caudal. Pectoral pointed,  $\frac{3}{4}$  length of head, twice as long as ventral and extending beyond base of latter. Caudal with pointed lobes. Caudal peduncle 3 times as long as deep,  $\frac{2}{3}$  length of head. 45 scales in the lateral line,  $\frac{11}{13}$  in a transverse series on the body,  $\frac{14}{12}$  in a transverse series between dorsal and anal, 8 round caudal peduncle. Silvery, brownish on the back and on the anterior rays of the dorsal.

Total length 105 millim.

A single specimen from Agberi.

This species is well distinguished from all others of the same genus in having only 8 scales round the caudal peduncle. It approaches *P. bane* Lacép. in the number of dorsal and anal rays, but differs in the larger eye and the fewer teeth.

## 8. MARCUSENIUS BRACHYHISTUS Gill.—Agberi.

9. *GNATHONEMUS CYPRINOIDES* L.—Agberi.

10. *GNATHONEMUS PETERSII* Gthr.—Oguta.

11. *MORMYRUS MACROPHthalmus* Gthr.—Agberi.

The type specimen of this species, registered as from "West Africa," came no doubt from the Niger, as I now find out through the association of the examples of other species received along with it.

12. *HYPEROPISUS BEBE* Lacép.—Abo.

13. *GYMNARCHUS NILOTICUS* Cuv.—Oguta.

#### NOTOPTERIDÆ.

14. *XENOMYSTUS NIGRI* Gthr.—Oguta.

#### CLUPEIDÆ.

15. *PELLONULA VORAX* Gthr.—Agberi.

#### CHARACINIDÆ.

16. *HYDROCYON FORSKALII* Cuv.—Assay.

17. *ALESTES NURSE* Rüpp.—Agberi.

18. *ALESTES MACROLEPIDOTUS* Cuv.—Agberi.

19. *MICRALESTES ACUTIDENS* Pters.—Agberi.

This species, described from Mozambique by Peters, has since been found in the Upper Niger by Dr. Christy, in the Ubanghi by Capt. Royaux, and in the White Nile by Mr. Loat.

20. *NANNÆTHIOPS UNITÆNIATUS* Gthr.—Abo.

21. *DISTICHODUS BREVIPINNIS* Gthr.—Agberi.

22. *DISTICHODUS ROSTRATUS* Gthr.—Agberi, Abo.

23. *DISTICHODUS ENGYCEPHALUS* Gthr.—Agberi, Abo.

24. *CITHARIDIUM ANSORGII* Blgr.—Abo.

This remarkable new generic type was described and figured in *Ann. & Mag. N. H.* (7) ix. 1902, p. 144, pl. iii.

25. *CITHARINUS GEOFFROYI* Cuv.—Agberi.

#### CYPRINIDÆ.

26. *LABEO SELTI* C. & V.—Agberi, Abo.

27. *LABEO SENEGALENSIS* C. & V.—Abo.



28. *BARBUS NIGERIENSIS*, sp. n. (Plate XXVIII. fig. 3.)

Depth of body equal to length of head, 4 times in total length. Snout rounded, projecting very slightly beyond the mouth, as long as the eye,  $3\frac{1}{4}$  times in length of head; interorbital width  $2\frac{2}{3}$  in length of head; lips indistinct; two pairs of barbels, the posterior as long as the eye, the anterior a little shorter. Dorsal III 8, last simple ray slender, flexible, a little shorter than the head; the fin, the border of which is scarcely emarginate, originates anteriorly to the base of the ventral and is nearer the occiput than the root of the caudal. Anal III 5, its longest ray  $\frac{2}{3}$  length of head. Pectoral a little shorter than head, not reaching ventral. Caudal forked. Caudal peduncle  $1\frac{1}{2}$  as long as deep. Scales  $25\frac{3\frac{1}{2}}{3\frac{1}{2}}$ ,  $2\frac{1}{2}$  between lateral line and ventral, 12 round caudal peduncle. Silvery, brownish on the back.

Total length 48 millim.

A single specimen from Agberi.

Allied to *B. camptacanthus* Blkr., but snout shorter, eye larger, and dorsal more forward in position.

29. *BARILIUS NILOTICUS* Joannis.

Was obtained in the Upper Niger by Dr. Christy.

## SILURIDÆ.

30. *CLARIAS LAZERA* C. & V.—Agberi, Abo.31. *GYMNALLABES TYPUS* Gthr.—Ossomari.32. *HETEROBRANCHUS SENEGALENSIS* C. & V.—Agberi.33. *EUTROPIUS NILOTICUS* Rüpp.—Ossomari.34. *SCHILBE SENEGALENSIS* C. & V.—Abo.35. *PARAILIA CONGICA* Blgr.—Abo.36. *CHRYSICTHYS BUETTIKOFERI* Stdr.—Assay.37. *CLAROTES LATICEPS* Rüpp.—Oguta, Abo.38. *AUCHENOGLANIS OCCIDENTALIS* C. & V.—Agberi, Assay, Oguta, Abo.39. *SYNODONTIS GAMBIENSIS* Gthr.—Assay.40. *SYNODONTIS ROBBIANUS* J. A. Smith.—Oguta, Abo, Ossomari.41. *SYNODONTIS MELANOPTERUS*, sp. n. (Plate XXIX. fig. 1.)

Præmaxillary teeth in several irregular series, forming a broad band; mandibular teeth 35 to 40, measuring about  $\frac{2}{5}$  the diameter of the eye. Depth of body  $3\frac{1}{2}$  times in total length, length of head  $3\frac{1}{3}$  or  $3\frac{2}{5}$ . Head a little longer than broad, convex on the

occiput; snout obtusely conical, a little less than  $\frac{1}{2}$  length of head; eye supero-lateral,  $5\frac{1}{2}$  times in length of head, 2 in interorbital width; upper surface of head granulate and pitted from between the eyes. Occipito-nuchal shield as long as broad, simply convex, terminating in two pointed processes. Gill-cleft not extending below base of pectoral. Maxillary barbel distinctly fringed at the base, as long as the head; mandibular barbels with rather short, simple branches, the outer barbels twice as long as the inner and measuring  $\frac{2}{5}$  length of head. Lips rather feebly developed. Humeral process granulate and feebly keeled, acutely pointed, extending as far as occipito-nuchal shield. Dorsal II 7; spine strong, shorter than the head, serrated behind. Adipose fin  $3\frac{1}{2}$  times as long as deep, as long as the head, 3 times as long as its distance from the rayed dorsal. Anal III 8. Pectoral spine slightly shorter than the head, strongly serrated on the outer edge, more strongly still on the inner. Ventral reaching, or nearly reaching anal. Caudal deeply forked, with pointed lobes. Caudal peduncle as long as deep. Skin of body smooth. Dark brown above and beneath; fins black, with some light cross-bands in the young.

Total length 110 millim.

Two specimens from Oguta.

42. *SYNODONTIS MEMBRANACEUS* Geoffr.—Assay, Abo.

43. *PHRACTURA ANSORGII* Blgr.—Agberi.

P. Z. S. 1901, ii. p. 623, pl. xxxvii. fig. 1.

#### CYPRINODONTIDÆ.

44. *HAPLOCHILUS SPILAUCHEN* A. Dum.—Degama.

45. *FUNDULUS GULARIS* Blgr.—Agberi.

P. Z. S. 1901, ii. p. 623, pl. xxxvii. figs. 2 & 3.

#### POLYNEMIDÆ.

46. *POLYNEMUS QUADRIFILIS* L.—Munanhor.

#### SERRANIDÆ.

47. *LATES NILOTICUS* L.—Agberi.

#### CICHLIDÆ.

48. *PELMATOCHROMIS PELLEGRINI*, sp. n. (Plate XXIX. fig. 2.)

Teeth in 2 or 3 series in each jaw. Depth of body  $2\frac{1}{3}$  to  $2\frac{2}{3}$  times in total length, length of head  $2\frac{2}{3}$  to  $2\frac{3}{4}$ . Snout with straight profile,  $1\frac{1}{2}$  to  $1\frac{2}{3}$  diameter of eye, which is contained  $3\frac{1}{2}$  to 4 times in length of head, and equals or nearly equals interorbital width; maxillary extending to about midway between

nostril and eye; 4 or 5 series of scales on the cheek; large scales on the opercle. Gill-rakers short and broad, 14 or 15 on lower part of anterior arch. Dorsal XVI-XVII 9-11; spines increasing in length to the last, which measures  $\frac{1}{2}$  length of head; median soft rays more or less produced,  $\frac{2}{3}$  to  $\frac{4}{5}$  length of head. Anal III 7, third spine a little shorter than the last dorsal, median soft rays produced like the dorsals. Pectoral about  $\frac{3}{4}$  length of head, not reaching origin of anal. Caudal rounded. Caudal peduncle as long as deep or a little deeper than long. Scales not ciliated, 28-29  $\frac{2\frac{1}{2}}{9}$ ; lat. l.  $\frac{20-22}{9-11}$ . Dark olive-brown above, yellowish beneath; a black opercular spot, followed by a rather indistinct dark band, extending to the root of the caudal; fins dark grey, spinous dorsal sometimes with a series of round black spots near the base.

Total length 135 millim.

Three specimens from Sapelle and one from Ossomari.

I have much pleasure in naming this fish after Dr. Pellegrin, of the Paris Museum, who is at present engaged on a monograph of the Cichlidæ, and who has pointed out to me the specific distinctness of this *Pelmatochromis* from *P. guentheri* Sauv., to which I had first referred it. The latter differs in the shorter posterior dorsal spines and the more truncate caudal fin.

49. *TILAPIA NILOTICA* L.—Abo.

50. *TILAPIA GALILÆA* Hasselq.—Agberi, Abo.

#### PLEURONECTIDÆ.

51. *CITHARICHTHYS SPILOPTERUS* Gthr.—Degama.

52. *CYNOGLOSSUS SENEGALENSIS* Kaup.—Degama.

#### Gobiidæ.

53. *Gobius NIGRI* Gthr.—Degama.

54. *Gobius SCHLEGELII* Gthr.—Agberi, Degama.

55. *Gobius GUINEENSIS* Peters.—Agberi, Assay, Abo.

*G. aeneofuscus*, var. *guineensis*. Peters, Mon. Berl. Ac. 1876, p. 248.

This is a smaller fish than the East-African *G. aeneofuscus*, growing to a length of 75 millim. only. The interorbital space is narrower.

Recorded from the Cameroon River by Peters; obtained by Miss Kingsley at Kondo-Kondo, Ogowé; by Mr. G. L. Bates in the Benito River, Gaboon.

#### MASTACEMBELIDÆ.

56. *MASTACEMBELUS LOENBERGII* Blgt. (Plate XXIX. fig. 3.) —Agberi, Abo, Oguta, Gregani.

Several specimens of this species, originally described from Cameroon. The largest measures 190 millim.

Depth of body 14 to 17 times in total length, length of head  $8\frac{1}{2}$  or 9 times. Length of head 4 to  $4\frac{1}{2}$  times in distance from snout to vent,  $1\frac{1}{2}$  to twice as great as its distance from first dorsal spine; a præorbital and 2 or 3 præopercular spines. Dorsal XXVIII–XXXI, 110–130; anal II, 110–130. The coloration varies: some specimens are nearly uniform brown, with an ill-defined darker lateral band, others are spotted with darker or with lighter; a series of alternating dark and light bars may be present at the base of the anal fin.

#### EXPLANATION OF THE PLATES.

##### PLATE XXVIII.

- Fig. 1. *Protopterus annectens*, young, p. 325.  
 2. *Petrocephalus ansorgii*, p. 325.  
 3. *Barbus nigeriensis*, p. 327.

##### PLATE XXIX.

- Fig. 1. *Synodontis melanopterus*, p. 327.  
 2. *Pelmatochromis pellegrini*, p. 328.  
 3. *Mastacembelus loennbergii*, p. 329.

3. Last Account of Fishes collected by Mr. R. B. N. Walker, C.M.Z.S., on the Gold Coast. By Dr. A. GÜNTHER, F.R.S., V.P.Z.S.

[Received November 7, 1902.]

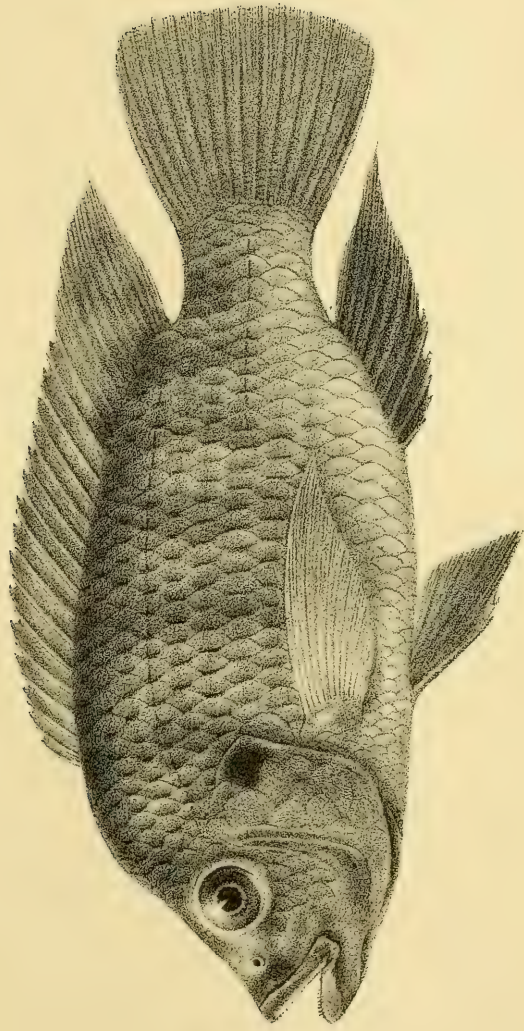
(Plates XXX.–XXXIII.<sup>1</sup> & Text-fig. 62.)

Shortly after the publication of my previous paper on Fishes from the Gold Coast (Proc. Zool. Soc. 1899, pp. 716–732), Mr. Walker paid another visit to that district. On this occasion he travelled into Ashantee, visited Lake Busum-chi, and followed the River Enon on a portion of his return journey. He did not long survive the fatigues of this, his last, voyage.

It was his intention to supply me with full particulars as regards the stopping-places at which he obtained the fishes; and I was all the more anxious to obtain this information, as some of the places are small and not important enough to be shown on any of the most recent maps of the country. Fortunately he was careful in labelling the bottles with the names and sometimes with the positions of the localities, although not always in a very legible manner; and supplementing this source of information with what I can gather from his letters, I am able to supply the following list:—

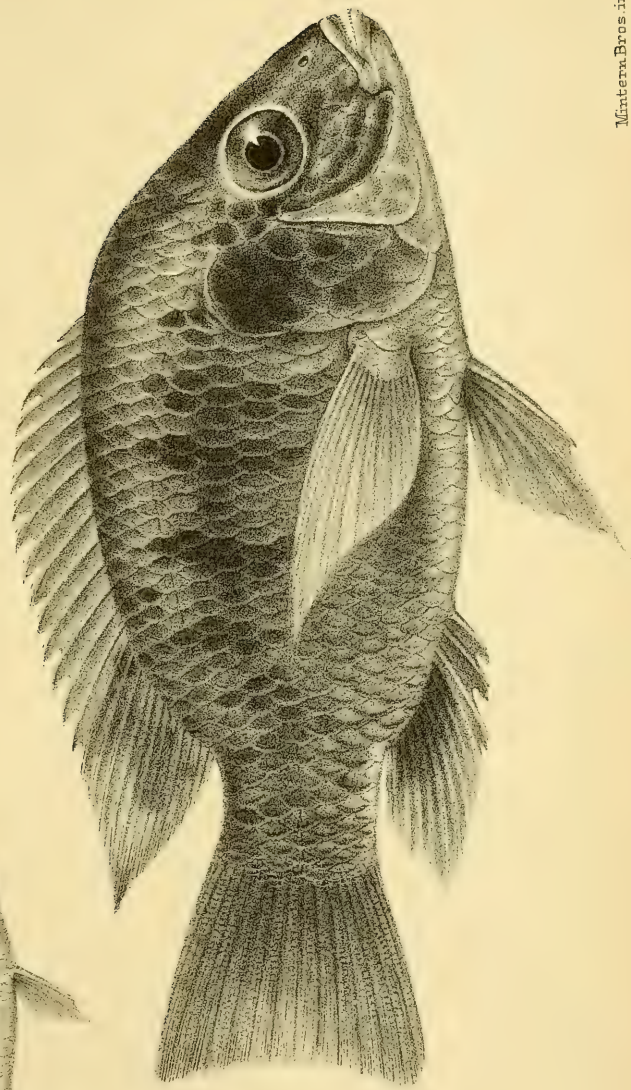
1. River Atesu,
2. River Ibbi, and

<sup>1</sup> For explanation of the Plates, see p. 339.

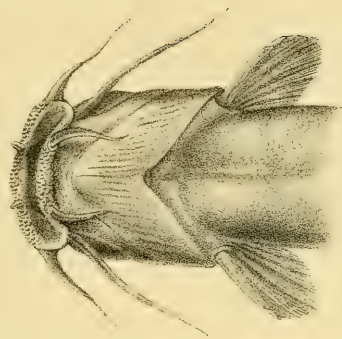






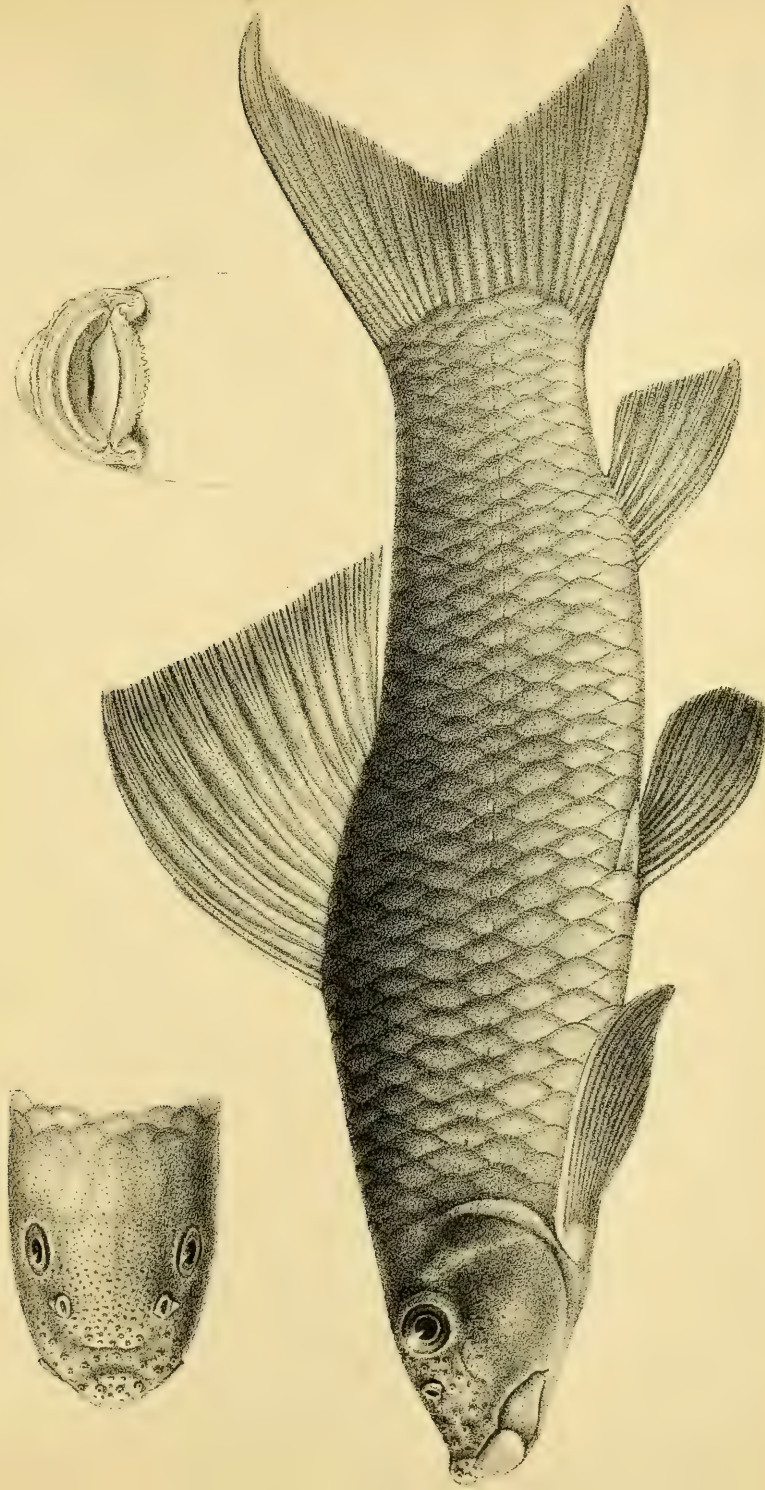












J. Green, del. et lith.

LABEO WALKERI

Mintern Bros. imp.



3. Bokitsa Mine—are two small rivers and a locality in the Wasa district.

4. Ingogosu is described on the label as a village in the mining centre of Kinkiankwã.

5. Infoan, a small place on a tributary of the River Offim.

6. Dunkwa, a place on the River Offim or on one of its tributaries. Mr. Walker speaks of it sometimes as a place and sometimes as a river. There is another place with the same name north and inland of Cape Coast Castle.

7. Odumasi, a place on the upper part of the River Enon, east of Koumassi.

8. Lake Busum-chi.

9. Nyankoma, a place on the River Enon.

10. Town of Akropon.

Mr. Walker's connection with commercial affairs on the West Coast of Africa extended over a period of more than forty years, the greater part of which he resided in the country. It seems that the late Mr. T. Moore, Curator of the Liverpool Museum, was the first to interest him in making collections of Reptiles and Fishes. He retained this interest to the end of his life, much advancing our knowledge of the fauna of the Gaboon country and the Gold Coast; and there is no doubt that he would have accomplished still more if circumstances had permitted us to supply him with more ample means than were at his disposal, while, moreover, the primary objects of his pursuits demanded nearly all his time and energy.

#### CHROMIS OGOWENSIS.

*Chromis ogowensis* Günth. Ann. & Mag. N. H. 1896, xvii. p. 271; Proc. Zool. Soc. 1899, p. 717.

This species is not to be united with *C. latus*, to which it has been referred by Boulenger (Proc. Zool. Soc. 1899, p. 125). In a smaller specimen of *C. latus* the anterior maxillary teeth are *absolutely* larger than, and the anterior mandibular teeth as large as, the corresponding teeth of larger specimens of *C. ogowensis*<sup>1</sup>. The pectoral fin may be rather shorter or rather longer than the head; it generally does not reach the anal.

Mr. Walker's latest collection contains several additional

<sup>1</sup> In treating of the species of *Chromis* in the Congo, Mr. Boulenger (Poiss. du Congo, p. 453) states that for specific discrimination no reliance is to be placed on the number of teeth in the outer premaxillary series: first, because it varies "selon les individus," and secondly, because as a rule the teeth are relatively smaller and more numerous in adult than in young specimens. The first statement is opposed to my experience. There are broad-toothed and narrow-toothed species; but, of course, there is some variation even in the former, and the limits of variation widen in species characterized by small and numerous teeth, in which case it is not even desirable or useful to attempt to state the number of teeth. That young individuals have a smaller number than adult is true, as I also have already stated in Proc. Zool. Soc. 1896, p. 217, but this dental development cannot be called variation; with the advancing growth of the jaws more teeth are added laterally. I continue to

specimens of this species; he collected them on the River Dunkwa, and at Nyankoma, R. Enon.

Some of these specimens differ in certain points, as the height of the spinous dorsal fin, the form of the cheeks, &c., from those previously received and among themselves. However, I regard these differences as merely individual variations; they are indicated in the following table, in which measurements are given in millimetres; the teeth are counted on one side of the upper jaw only:—

<i>Ch. ogowensis</i> :	Total length.	Length of head.	Length of 8 D. spine.	Height of cheek.	Length of cheek.	Teeth in upper jaw.	Gill-rakers.	P. just reaching A.	P. not reaching A.
1. Lambarene, type ...	170	47	19	12	12	28	11+3	*	
2. Kotehwah R. ....	154	37	16	9	10	23	11+3	...	*
3. Prah R. ....	142	36	18	8	10	27	12+4	...	*
4. Prah R. ....	140	35	16	8	10	26	11+4	...	*
5. Kakum R. ....	162	42	20	10	13	29	12+5	...	*
6. Kakum R. ....	140	35	18	7	11	25	13+4	*	
7. Kakum R. ....	117	30	15	6	9	25	12+4	...	*
8. Dunkwa R. ....	130	32	17	7	10	25	11+4	...	*
9. Dunkwa R. ....	125	32	17	7	10	24	12+4	*	
10. Nyankoma ....	132	33	16	7	10	24	11+3	...	*
11. Nyankoma ....	129	33	16	7	11	26	12+5	...	*
12. <i>Ch. latus</i> , type ....	112	28	13	6	9	19	9+3	...	*

#### CHROMIS DISCOLOR, sp. n.

D.  $1\frac{5}{8}$ . A.  $\frac{3}{8}$ . L. lat. 29–30. L. transv. 3/11.

Nineteen or twenty teeth on each side of the upper jaw. Maxillary rather short, not extending to the vertical from the front margin of the eye. Upper profile of the snout straight; interorbital space flat, wider than the orbit, which is nearly one fourth of the length of the head. Three series of scales on the

regard the size and number of teeth as a valuable specific character which should always be taken into consideration, combined with a statement of the size of the specimens to which the statement of the dental number applies.

Therefore I must demur to Mr. Boulenger's statement that in *C. ogowensis* the teeth "vary" from 15 to 30 on each side (*l. c.* p. 466). The typical specimen, from which alone my original description is taken, is 170 millim. long, and probably mature. The collector put into the same bottle two young specimens, 62 and 66 millim. long, which presumably may belong to the same species. I say presumably, for I confess that the uncertainty and difficulties attending the determination and specific discrimination of the young of closely-allied species of *Chromis* are too great to allow me to offer a categorical opinion upon them.



cheek. Form of the body rather oblong, its depth being contained  $2\frac{1}{3}$  or  $2\frac{1}{2}$  in its length (without caudal), and more than the length of the head. Gill-rakers of the outer arch twelve ( $4+8$ ). Pectoral fin as long as, or even slightly longer than, the head, extending to the vent or origin of the anal. Ventral produced into a filament which may reach beyond the origin of the anal. The eighth dorsal spine is contained  $2\frac{1}{2}$  or  $2\frac{1}{3}$  in the length of the head. Caudal fin truncate, with the corners pointed. Scales cycloid. Colour variable: the whole fish may be brownish-black, the vertical and ventral fins and the base of each scale being deep black; or it may be of a uniform light colour, with some irregular black blotches on the opercle and throat.

Three specimens from Lake Busum-chi, measuring from 100 to 125 millim.

CHROMIS BUSUMANUS, sp. n. (Plate XXX.)

D.  $1\frac{5}{6}$ . A.  $\frac{3}{8}$ . P. 13. L. lat. 29-30. L. transv. 3/11.

Scales cycloid, those on the cheek in three (two<sup>1</sup>) series. Teeth small, a few notched, in several series, from 24 to 28 on each side of the upper jaw; those of the lower jaw minute. Mouth rather small, the maxillary scarcely reaching the vertical from the anterior border of the eye. The depth of the body is *two fifths* of the total length (without caudal), the length of the head one third. Eye one fourth of the length of the head, two thirds of that of the snout, and rather less than the width of the inter-orbital space. *Nape of the neck more or less elevated, rendering the upper profile of the head slightly concave.* Pectoral fin as long as the head, extending nearly to, and sometimes even to, the origin of the anal. Caudal fin truncate or scarcely emarginate, with the corners rounded, or with the upper angular and the lower rounded, scaly at the base. The spinous dorsal fin rather low, the length of the eighth spine being about one third of that of the head. Gill-rakers of the outer branchial arch from 15 to 17 on the whole arch, or from 11 to 12 on its lower portion. Coloration uniform, or with six very indistinct cross-bands; operculum and dorsal fin with the usual black spot.

Total length 135 millim.

Several specimens from Lake Busum-chi.

CHROMIS MULTIFASCIATUS, sp. n. (Plate XXXI.)

Allied to *C. macrocephalus* Bleek.

D.  $1\frac{5}{8}$ . A.  $\frac{3}{8}$ . P. 13. L. lat. 28. L. transv. 3/11.

Scales cycloid, those on the cheek in two series. Teeth very small, in several series, notched, about 36 or 34 on one side of the upper jaw<sup>2</sup>; those of the lower jaw minute. Mouth small, transverse, the maxillary terminating at some distance in advance

<sup>1</sup> Three series in three species, in two others the third series is reduced to a single scale.

<sup>2</sup> Young specimens of about 70 millim. in length have a smaller number, viz. 28 or 30.



of the orbit. The depth of the body is contained  $2\frac{1}{3}$  times in the total length (without caudal), the length of the head  $2\frac{1}{3}$  or  $2\frac{2}{3}$  times. Eye one fourth of the length of the head, and rather more than two thirds of that of the snout and of the width of the interorbital space; it is therefore a little nearer to the end of the snout than to the end of the opercle. Interorbital space transversely somewhat convex; upper profile of the head nearly straight. Pectoral fin as long as the head, extending to or beyond the origin of the anal fin. Caudal fin truncated, scaly at the base. Gill-rakers of the outer branchial arch from 24 to 26 on the whole arch, or from 19–22 on its lower portion<sup>1</sup>. Body with well-marked black cross-bands, eight or nine in number in young individuals, alternately deeper in colour and broader in width, the foremost (if distinct) being above the root of the pectoral fin, the second opposite to the fifth or sixth dorsal spine. In mature individuals the narrower cross-bands disappear, only five remaining, the last being across the root of the caudal. A large black opercular spot; sometimes a rounded blackish spot behind the last dorsal spine.

Total length .....	143 millim.
"                  " without caudal ...	112   "
Length of eighth dorsal spine ...	15   "

Several examples from Lake Busum-chi.

*CLARIAS KINGSLEYÆ*, sp. n.

D. 79–87. A. 68. P. 1/9.

Vomerine teeth villiform, forming a horseshoe-like band, narrowed in the middle, its broadest part being as broad as the intermaxillary band; each half of the latter is not quite twice as wide as it is broad, and laterally scarcely extends as far outwards as the vomerine band. Head covered above with thick skin, two elevenths of the total length (without caudal), or nearly twice the distance from the origin of the dorsal fin. The width of the interorbital space is nearly one half of the length of the head. Barbels moderately long; the nasal nearly reaching to the gill-opening, the maxillary nearly to the origin of the dorsal fin, which is somewhat behind the end of the pectoral. Anal fin not low. No free space separating the caudal from the other vertical fins. Coloration uniform.

Total length 280 millim.

One specimen from Odumasi, another from Infoan on the R. Offim.

*HETEROBRANCHUS ISOPTERUS* Blkr.

Two specimens from Nyankoma and Infoan.

<sup>1</sup> As the branchial arch is in many of the species a segment of a more or less perfect circle, it is difficult to fix the boundary between its "lower," posterior or upper portion, and therefore it appears to be safer to count the gill-rakers of the whole arch, and not of a portion alone,

**EUTROPIUS MENTALIS.**

*Eutropius congensis* Günth. Proc. Zool. Soc. 1899, p. 730.

*Eutropius mentalis* Bouleng. Poiss. Congo, 1901, p. 269.

A dozen young specimens (5-7 in. long) were collected by Mr. Walker on the R. Offin. I believe them to be the same as a specimen of much larger size from the Prah River which, although it had its fin-spines mutilated, I referred to *E. congensis*. These young specimens do not quite agree among themselves as regards the comparative length of the barbels, but all have the nasal barbel considerably shorter than the maxillary or outer mandibular one; and therefore I hesitate to refer them to *Eutropius mandibularis*<sup>1</sup>. The amount of variation in the length of the barbels within the limits of a species, and any change in this character dependent on growth, are quite unknown at present.

**CHRSYCHTHYS WALKERI.**

*Chrysichthys walkeri* Günth. Proc. Zool. Soc. 1899, p. 720.

One specimen, R. Offin.

**CHRSYCHTHYS LAGOENSIS. (Text-fig. 62, p. 336.)**

*Chrysichthys lagoensis* Günth. Proc. Zool. Soc. 1899, p. 725.

One specimen, Nyankoma.

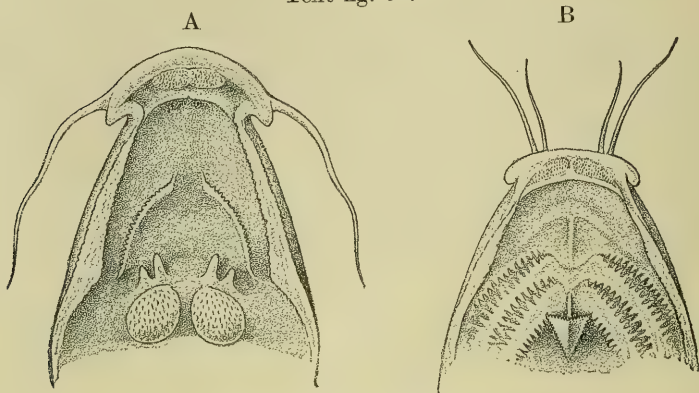
This specimen is a male 177 millim. long. It presents a peculiar modification of the integument of the buccal cavity, which I have also observed in other specimens of this genus, in which, however, the excrescences were collapsed and indistinct owing to the less perfect state of preservation. On the palate (text-fig. 62, A) the mucous membrane is raised into two fringed ridges divergent towards the pharynx; the upper part of the pharynx is occupied by a pair of large, elliptic, soft, cushion-like pads, into which the pharyngeal denticles are sunk, and in front of each of which two long papillæ are suspended from the roof of the pharynx. Below (text-fig. 62, B), in the median line between the roots of the anterior branchial arches, a high, short ridge rises, with a fringed flap dependent on each side; finally each branchial arch is provided with two rows of soft papilliform gill-rakers.

There are two functions which may be ascribed to this singular structure. It may serve as an organ of taste by which the fish is able to distinguish in muddy water between nutritive and uneatable substances: or, as many Cat-fishes carry their ova and young in the mouth, it may assist in the lodgment or, perhaps,

<sup>1</sup> Unfortunately I am unable to re-examine the type of *E. mandibularis*. The majority of the specimens described in the paper quoted were lent to me for description by my friend, the late Mr. T. Moore, Curator of the Free Public Museum, Liverpool, with the understanding that all unique types should be returned to him. This was done, and the safe arrival of the specimens acknowledged by him. However, none of them can now be found by Mr. Moore's successor, Dr. J. O. Forbes, who, at my request, kindly instituted a search for them.

in the nutrition of the fry. In a female 377 millim. long the structure is but little developed.

Text-fig. 62.

Mouth of *Chrysichthys lagoensis*.

A, palatal view; B, lower view.

#### AMPHILIUS PLATYCHIR Gthr.

This species varies somewhat in the relative proportions of the dorsal fins. In well-nourished and well-preserved examples the adipose fin rises along a greater extent of the dorsal profile, thus approaching nearer to the rayed fin: a condition not rarely observed in other Siluroids with a long adipose fin. The barbels are distinctly compressed. The back of these Gold Coast specimens is marbled; dorsal and caudal fins with a black band across the base and another across the middle.

The specimens were collected on the River Atesu, and are probably young, being  $2\frac{1}{2}$  inches long. The occurrence of these specimens at no great distance from the mouth of the river proves that *Amphilius* is not confined to mountain-streams<sup>1</sup>.

#### NOTOGLANIDIUM, g. n

Head broad, depressed, covered with thick skin; eyes small, without free orbital margin, situated at the upper side of the head; posterior nostrils in a pit rather nearer to the eye than to the end of the snout, anterior in the upper lip, terminating in a short tube pointing downwards. Snout broad, with rather wide mouth and three pairs of barbels. Teeth minutely villiform, none on the palate. Gill-membranes attached to the isthmus without

<sup>1</sup> The typical specimens are stated to be from Sierra Leone, and there is no reason to doubt the correctness of the statement (see Boulenger, Ann. & Mag. N. H. 1898, i. p. 254). They were given to me on the occasion of a visit to Fort Pitt Museum in 1862 by one of the Army surgeons, who had brought them from Sierra Leone where he had been stationed.

a free central portion. Anterior dorsal rather long, with more than seven rays and with a pungent spine; adipose fin low and long; ventrals six-rayed, below the posterior third of the dorsal.

*NOTOGLANIDIUM WALKERI*, sp. n. (Plate XXXII.)

D. 1/14-15. A. 12. P. 1/7. V. 6.

Body moderately elongate, of nearly the same depth in its whole length, the tail being strongly compressed. Head depressed, much broader than deep, two-sevenths of the total length (without caudal); the very small eye entirely in the anterior half of the head; snout broad, depressed, two fifths of the length of the head, nearly twice as long as the interorbital space is long. Mouth anterior, with the upper jaw rather larger, surrounded by fleshy lips; all the barbels are rather thick near their base: the maxillary extending to the middle of the operculum, the outer mandibular to the base of the pectoral fin; the inner mandibular rather shorter than the maxillary. The maxillary patch of teeth is single, oblong, small, but wider than long; the mandibular patches separated in the middle, smaller than, but similar in outline to, the maxillary.

Pectoral fins short, not longer than ventral, with a strong spine, which, however, is enveloped in thick skin, only its point being free. Dorsal fin very low, only about half as high as the body, with a singularly short spine, not quite half as long as the snout. Adipose fin long, low, commencing shortly behind the dorsal and subcontinuous with the caudal. Caudal rounded.

Reddish-brown, darker on the back, body, dorsal and caudal fins, with scattered round black spots, the spots on the caudal fin being the more numerous and smaller.

Total length 122 millim.

Two specimens from the River Ibibi (Apollonia).

*SYNODONTIS ROBBIANUS* J. A. Smith.

Several young specimens (3-6 in. long) from the R. Offim.

On comparing these specimens with the single young specimen of *S. robbianus*, I find that they have the interorbital space a little broader than the Old Calabar fish. This does not seem to me to constitute a distinctive specific character.

*MALAPTERURUS ELECTRICUS* L.

A young specimen from the R. Offim.

*BARBUS CAMPTACANTHUS* Bleek.

Many specimens were collected at Infoan, at the town of Akropon, and on the River Atesu.

*BARBUS TRISPILUS* Bleek.

Many specimens from Infoan, Akropon, and Ingogosu, a village in the mining centre of Kinkiankwã.

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## LABEO WALKERI sp. n. (Plate XXXIII.)

Closely allied to *L. brachypoma*.

D. 14. A. 7. L. lat. 33. L. transv. 4/6.

Mouth broad. Lips very thick, with a distinct inner fold in their entire circumference; lower lip fringed along its anterior and posterior margins. Snout thick, produced, much projecting beyond the lower jaw, with a broad lobe on each side; the terminal portion of the snout is rather contracted and turned upwards; maxillary barbel small, hidden in the lateral groove. Eye lateral, immediately below the upper profile, about as large as the exposed portion of a scale, situated entirely in the posterior half of the head. Head small and thick, a little less than one fourth of the total length (without caudal); the width of the flat interorbital space one half of the length of the head. Gill-cover very short. There are three longitudinal series of scales between the lateral line (which is indistinct) and the ventral fin. The free portion of the scales much higher than long. Dorsal fin high, with the upper margin straight, equidistant from the root of the caudal and the front margin of the orbit; anal extending to the root of the caudal, at least in our largest example; caudal forked. Pectoral fin not reaching the base of the ventral; ventral inserted in front of the vertical from the last dorsal ray. Body moderately elongate, tail strongly compressed; the height of the body is not quite one fourth of the total length (without caudal); free portion of the tail as deep as long, its greatest depth being two thirds of the length of the head. Coloration uniform.

Snout covered with tubercles in mature specimens.

Several specimens from Nyankoma, the largest measuring 205 millim.

## HAPLOCHILUS SPILAUCHEN Dum.

Town of Akropon, and Infoan (a village on a tributary of the Offin R.).

## HAPLOCHILUS INFRA-FASCIATUS Gthr.

Bokitsa Mine (Wasa district); R. Atesu.

## ALESTES LONGIPINNIS Gthr.

*Alestes chaperi* Sauvage, Bull. Soc. Zool. France, vii. 1882, p. 320, pl. v. fig. 3.

From the examination of a long series of specimens, including types of *A. longipinnis* and *A. chaperi*, I come to the conclusion that the two forms should not be specifically separated. *A. longipinnis* was described as having the origin of the dorsal fin nearer to the end of the snout than to the root of the caudal, *A. chaperi* being distinguished by a more backward position of that fin. However, in some of the specimens before me the first dorsal ray is exactly midway between those two points; and I am unable to find any other specific differences.



ALESTES MACROLEPIDOTUS C. V.

R. Offim and R. Enon, village of Nyankoma.

PETERSIUS OCCIDENTALIS Gthr.

Many specimens from Akropon and Infoan.

HYDROCYON LINEATUS Schleg.

R. Offim and R. Enon, Nyankoma.

SARCODACES ODOË Bl.

R. Enon, Nyankoma.

NANNOCHARAX FASCIATUS Gthr.

Town of Akropon.

MORMYRUS USSHERI Gthr.

R. Offim.

#### EXPLANATION OF THE PLATES.

##### PLATE XXX.

*Chromis busumanus*, p. 333.

##### PLATE XXXI.

*Chromis multifasciatus*, p. 333.

##### PLATE XXXII.

*Notoglanidium walkeri*, p. 337.

##### PLATE XXXIII.

*Labeo walkeri*, p. 338.

#### 4. On a Specimen of the Okapi lately received at Brussels.

By C. I. FORSYTH MAJOR, F.Z.S.

[Received November 18, 1902.]

(With Text-figures 63-67.)

Last month the Authorities of the Congo Independent State received the skin of an Okapi which was at first supposed to have been obtained by a missionary stationed at or near Stanley Pool, but which subsequently proved to have been forwarded by the Commandant Sillye, "chef de la zone du Haut-Ituri." Though it was apparently of an adult individual, the skin shows no traces of horns.

The examination and comparison of the two Brussels skins, of which photographs are exhibited, show first of all that in the pattern of the striping, especially of the hind-quarters, some variation occurs between one side and the other; this warns us not to attach too much importance to similar variations when

occurring in different specimens. Also, when pointing out the differences in this respect between the horned Tervueren and the London specimen<sup>1</sup>, I have taken care to state in a general manner that the latter differs from the former in the predominance of the white over the black in the fore legs, and in the converse condition in the hind legs. The general coloration of the Tervueren skins is dark brown, as opposed to the rich red-brown colour of the specimen in the Natural History Museum, which shows a darker dorsal stripe; the dorsal stripe in the former being lighter than the general coloration. The lateral parts of the face, which are creamy white in the London specimen, are greyish in the mounted individual of Tervueren. In all these features excepting the dorsal stripe, which I have omitted to verify, the newly-arrived skin agrees with the Tervueren specimen.

The last mail, which arrived at Antwerp the 4th of this month, brought the skeleton of the specimen to which belongs the skin received a few weeks before.

The animals are apparently skinned by the natives on the spot where they are killed, which may be situated at a considerable distance from the nearest post; their invariable custom in skinning the animal seems to be to cut away the generative organs, so that the Belgian officials have to rely on the information of the natives as to the sex of an individual. In the case of the London specimen and the one arrived the other day, there was no information whatever in this respect. The first skin received at Brussels was stated to be that of a female, and, as I had at the time no reason to doubt this statement, I described<sup>2</sup> the adult female of the Okapi as being provided with horns like the male.

The skull recently received is that of a quite adult individual; the teeth are well worn and the coronal suture is obliterated. The two bumps rising from the posterior region of the frontals show about the same degree of development as in the larger of the two skulls in the Natural History Museum, but the diffuse swelling of the surrounding region, produced by a greater development of the underlying air-sinuses, makes them appear less prominent.

There are no traces whatever of horns. Apart from this, the skull exhibits the same characters which I have pointed out as being of specific value in the horned skull; it is narrower still than the latter, the absence of horns sufficiently accounting for this difference; the maximum of width is situated behind the orbits, therefore further back than in the London skull; the parietal region and the zygoma are shorter; and the maxillary region above the cheek-teeth lower, both absolutely and relatively. The last character appears to acquire more weight from the circumstance that the London skull is not adult, because the vertical

<sup>1</sup> 'La Belgique Coloniale,' Nov. 9th, 1902, p. 532.

<sup>2</sup> 'La Belgique Coloniale,' May 25th, 1902, p. 245; P. Z. S. 1902, ii. p. 77.

diameter of the maxillary increases with age in the Ungulates generally and in the Giraffe in particular.

Another feature which seems to be of specific value and which is rather striking, is the difference in the shape of the orbits. Professor Lankester has described the orbits of the London specimen as rectangular, whereas in the two specimens of the Tervueren Museum they are circular as in the Giraffe. I was at first inclined to ascribe this disagreement to a difference of age; but on closer inspection I do not see how by further growth this change of form could be brought about. In the Ruminants generally it is precisely in the young that the orbit is more regularly circular.

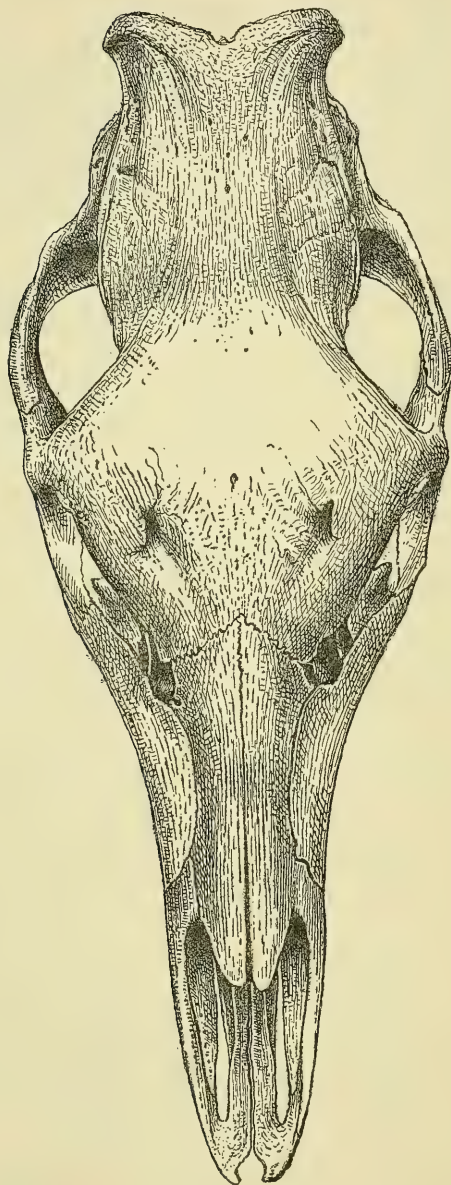
Considering the agreement of the two skulls and the two skins, I have not hesitated to ascribe the specimen lately arrived to the same species as the skeleton of the one and the skin of the other of the two individuals formerly received by the Tervueren Museum.

The absence of horns in this adult specimen is, in my opinion, a sexual character; the hornless skull being besides slenderer, as is the case generally in female Ruminants. This conclusion as to the sex was arrived at before the pelvis belonging to the same skeleton as the hornless skull had been examined; the pelvis having been sent to London, I have been able to compare it with the one belonging to the horned skull. There cannot remain the slightest doubt that the former is that of a female, the latter that of a male individual.

It follows that not only the skeleton, of which the horned skull forms part, is that of a male—and about this I have never had any doubt—but also that the mounted skin of the Tervueren Museum, which also exhibits horns, is of the male sex. The difference in size and the slight differences in shape of the two pairs of horns are due to the skin being that of a younger specimen, as is evident from the non-fusion of its ossicuspis with the frontal.

At present the exact locality of the specimen last arrived is unknown. According to information received by the Congo State authorities, it results that the Okapi is not restricted to the region inhabited by the Wambutti dwarfs. Five years ago, in 1897, an agent of the Congo State forwarded to his superiors the description of a beast which he believed to be an antelope and which is called *Ndumbe* by the Momvus, a tribe bordering to the south of the Mangbattu country (lat. 3° N., long. 28° E.), whence the skins exhibited to a former meeting by Mr. Boulenger were obtained. The description of the "*Antilope ndumbe*" is clearly that of an Okapi:—"De taille supérieure au buffle, tête noire, le cou et le corps brun marron; arrière-train zébré par des raies noires et blanches. Ces raies forment des anneaux sur les quatre membres. La queue est longue de 50 centimètres et terminée par une touffe de poils. Elle a les formes gracieuses et arrondies du zèbre. Sa chair est excellente."

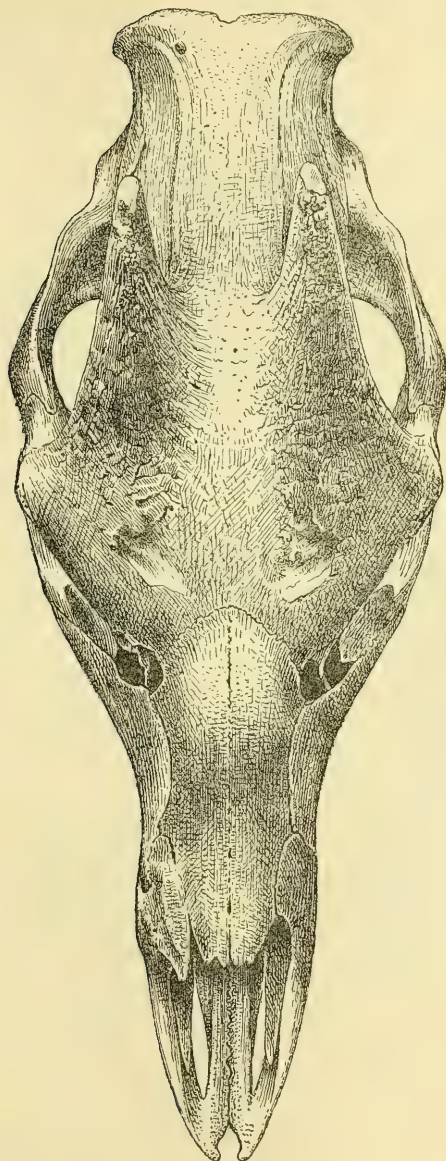
Text-fig. 63.

Upper view of skull of *Okapia liebrechtsi*, adult ♀.  $\frac{1}{3}$  nat. size.

Congo State Museum at Tervueren, near Brussels.



Text-fig. 64.

Upper view of skull of *Okapia liebrechtsi*, adult ♂.  $\frac{1}{3}$  nat. size.

(From the same specimen as that figured in side view above, p. 73 (text-fig. 7).  
Congo State Museum at Tervueren.)



Lieutenant Leoni, who forwarded to Brussels the first specimens, also writes that the Okapi is called *N'dumbe* by the Momvus, between the rivers Nepoko and Adjamu, and on the Rubi, and that he himself had met with two herds on the Nepoko. He mentions besides two other names of the Okapi: in the country of the Mokumus it is called *M'Boote*, and in the Kiu-vuailia country *Kenghe*. I have not been able to find these two districts marked on the maps.

There are already quite as many native denominations known as there are binomial names for the Okapi, but it does not follow that each tribe enjoys the possession of a distinct form. To return for a moment to the question of different species: from what I have said, it may be seen that the new material rather confirms my view as to the specific distinctness of the Brussels specimens, although speaking generally I am *à priori* more in sympathy with uniting than with dividing species, and have come to consider new specific names as being in many cases an evil, although a necessary one.

Personally I esteem it a more fascinating and a more important task to investigate the relations of the Okapi with the Giraffe on the one hand, and its fossil relatives on the other. This investigation culminates in the question, to which I have already endeavoured to give an answer<sup>1</sup>, whether the main characters in which the Okapi differs from the Giraffe are generalized characters, or whether it is the reduced, degenerate survivor of a series, "the most modern and most modest member of a tribe which has flourished in bygone times," as it has been put<sup>2</sup>. I hope to show that a similar inquiry is not "a fruitless amusement."

The importance of the discovery of the Okapi from a scientific point of view consists, of course, in the quite unhoped-for addition of a second living genus to a family of Ruminants which was hitherto represented in the recent fauna by the isolated and aberrant type of the Giraffe alone.

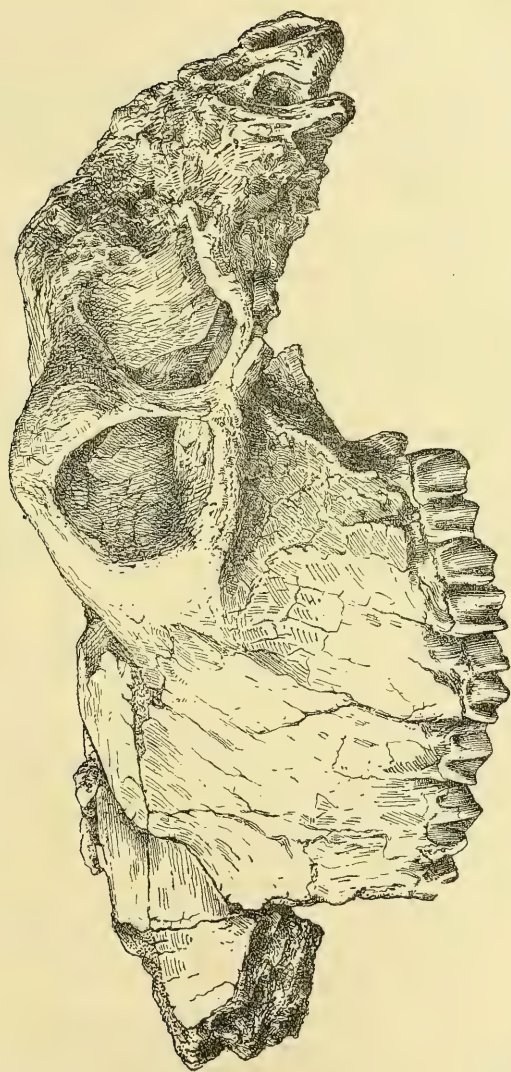
One important point upon which the Brussels material has thrown light is the mode of development of the horns. The horn-cones which had remained attached to the first skin received in Brussels having been macerated, it became clear that, as in the Giraffe, the horns of the Okapi are composed of two parts: (1) of the tuberosities or bumps of the cranial bones—the frontal alone in the case of the Okapi—which increase with age; and (2) of the sort of epiphysis, termed *ossicusp* by Prof. Lankester, which in the younger animal is separated from the underlying frontal by a stratum of fibrous structure, but finally co-ossifies with the frontal, without any trace of a suture remaining in the old animal.

Apart from the circumstance that in the Giraffe this "*ossicusp*" is placed on two bones, the parietal and the frontal, we have this other difference, that the tips of the horns present a polished

<sup>1</sup> 'La Belgique Coloniale,' May 25th, 1902, p. 245; P. Z. S. 1902, ii. p. 79.

<sup>2</sup> P. Z. S. 1892, ii. p. 214.

Text-fig. 65.



Side view of incomplete skull of *Samotherium boissieri*, adult ♀.  $\frac{1}{3}$  nat. size.

Original, from Upper Miocene of Samos, in the Brit. Mus.

appearance in the Okapi, suggesting that they had not been covered by skin. This would imply that very probably the tips of the horns are shed. As this question will doubtless very soon be resolved by the arrival of new material, I find it safer to leave it open for the present, the polishing being possibly due to some other cause.

I have classed the characters of the Okapi, cranial and others, first of all into four categories, according to their agreement with or disagreement from, the nearest related fossil forms, *Palæotragus* (= *Samotherium*) on the one hand, and the Giraffe on the other; a fifth category gives the characters according to which it holds an intermediate position.

I. *The characters which the Okapi shares with Palæotragus*, besides those which both have in common with the Giraffe, are the following:—

1 & 2. Proportionate length of the limbs and of the neck. I have formerly stated<sup>1</sup> that in this respect the Okapi closely agrees with the fossils.

3. One pair of horns only, situated on the frontal bones alone, and presumably present only in the male sex (see text-figs. 63–66).

4. Elongated and horizontal parietal region.

5. Lower contour of mandible convex (almost horizontal in the Giraffe), anterior portion of mandible turned upwards and more massive than in the latter; for characters 5 and 6 compare the text-figs. 6 (*Samotherium*) and 7 (*Okapia*) on p. 73 of my former paper with text-figs. 11 and 12 (*Giraffa*) on p. 76.

6. Lower contour of præmaxillaries and of adjoining anterior portion of maxilla horizontal (bent downwards in the adult Giraffe).

## II. *Characters in which the Okapi differs from Palæotragus.*

1. Smaller size of incisors and canine, a feature pointed out already by Prof. Lankester.

2. Cheek-teeth more brachyodont, at any rate more so than in the larger fossil form, *Samotherium boissieri*.

3. Air-sinuses of the cranial bones much more developed, extending even to the *basis cranii*.

4. Narrow frontal region, orbits not telescopic (compare text-figs. 63 and 64 with text-figs. 65 and 66).

5. Orbits situated more forward in relation to the cheek-teeth series.

6. Horns placed farther backward and comparatively smaller.

7. Mandibular angulus more produced backward.

8. Five tarsal bones—cuboid; scaphoid; cuneiforms 1, 2, & 3—are fused into one bone (in *Palæotragus* into three, as in the great majority of Ruminants).

<sup>1</sup> 'La Belgique Coloniale,' May 25th, 1902, p. 245; P. Z. S. 1902, ii. p. 78.

III. *Characters which the Okapi has in common with the Giraffe.* Those characters mentioned in paragraph I. which are equally shared by all three animals, together with the following :—

1. Horns covered by the skin; their mode of growth in the main identical.

2. Extensive air sinuses of the cranial bones.

3. Shape of the mandibular angulus of the Okapi approaching the Giraffe, though somewhat intermediate between the form in the latter and that of *Palæotragus*.

4. Fusion of the five tarsal bones mentioned—this takes place in the two known skeletons of the Okapi; it is not the *general* rule in the Giraffe.

IV. *Characters in which the Okapi differs from the Giraffe.*

1. Smaller size.

2. The differential characters of the skins.

3. All those features which, apart from the family characters, the Okapi has in common with *Palæotragus*.

4. Cranial air-sinuses less developed in the Okapi, with the exception of those in the bony palate, which are conversely *much more* developed in the Okapi than in the Giraffe.

5. Narrow frontal region; orbits not telescopic (compare text-figs. 63 and 64 with text-fig. 67).

6. More anterior position of the orbits.

7. Tympanic bullæ and ears larger.

8. Apparent later development of the horns, which remain smaller.

V. The Okapi holds an *intermediate* position between *Palæotragus* and the Giraffe in the following characters :—

1. Degree of development of the air-sinuses in the cranial roof-bones.

2. Position occupied by the paired horns (compare text-fig. 7 (p. 73) with text-fig. 6 (same page) and text-figs. 11 and 12 (p. 76).

3. Conformation of the mandibular angulus, which is more produced backward than in *Palæotragus*, but less so than in the Giraffe. See the side views of the crania on pp. 73 and 76.

VI. A very few features are *common to the Giraffe and to Palæotragus*, to the exclusion of the Okapi.

1. Large incisors and canine.

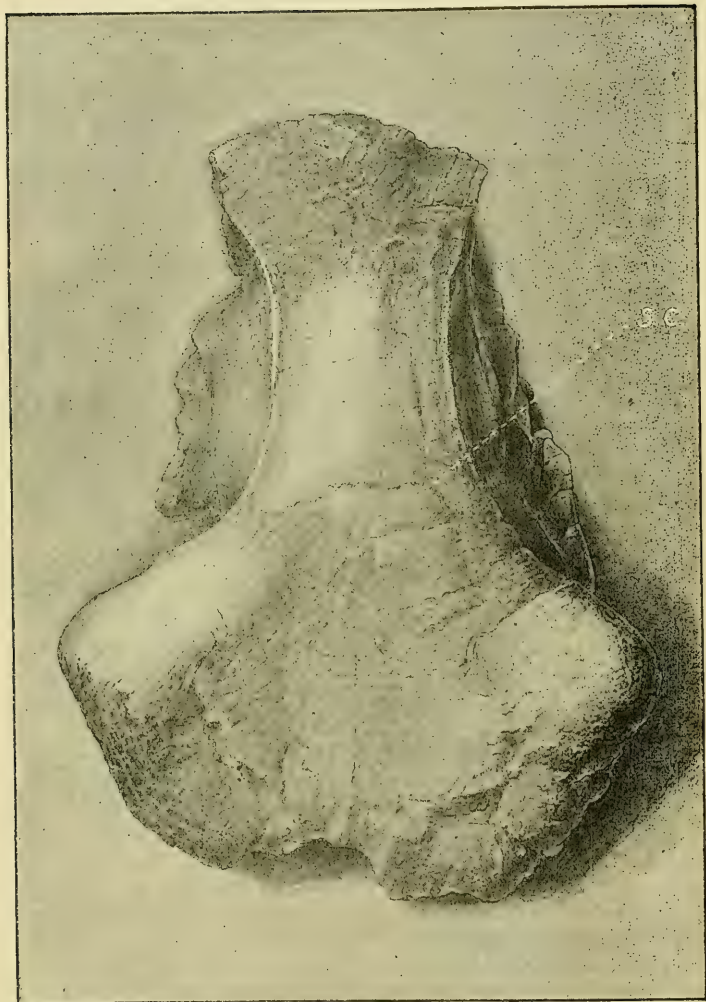
2. Backward situation of the orbits in relation to the tooth-series.

3. Broad frontal region; orbits telescopic.

Almost all the characters in which the Okapi differs from the Giraffe are more primitive features. The exceptions are the large air-sinuses in the bony palate of the Okapi, and presumably also the large size of the ears. As pointed out, the Okapi shares a great part of these primitive features with the fossil Giraffidæ



Text-fig. 66.



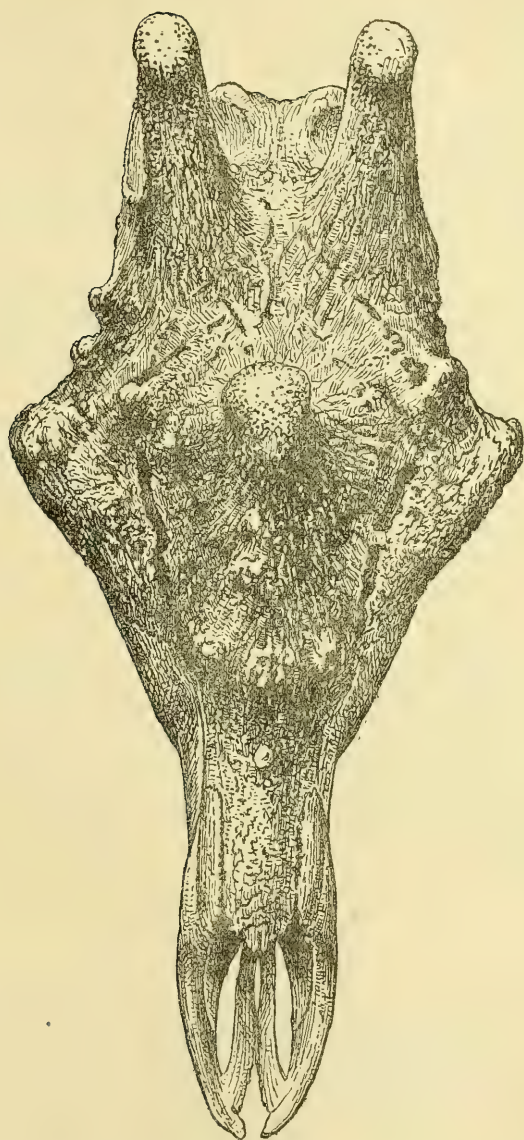
Upper view of the posterior portion of the skull of *Samotherium boissieri*,  
adult ♀.  $\frac{1}{3}$  nat. size.

Upper Miocene of Samos. Same specimen as that figured in side view above, p. 74  
(text-fig. 9). Barbey Collection, Valleyres (Switzerland), No. 15.

s.c. = coronal suture.



Text-fig. 67.



Upper view of the skull of *Giraffa camelopardalis*, adult ♂.  $\frac{1}{2}$  nat. size.

From Guas'Ngishu Plateau on Mt. Elgon, Brit. E. Afr.—B. M.

here considered. There are several, however, by which it appears to be *even more generalized than* *Palæotragus*; namely, the narrow frontal region with its non-telescopic orbits, the anterior position of the latter, the smaller size of the horns, and the more brachyodont condition of the cheek-teeth (as compared with the large fossil species *Samotherium boissieri*). In one feature only, the large extension of the air-sinuses in the bony palate, the Okapi has conversely progressed further than the Giraffe.

*Palæotragus*, finally, is more generalized than the Okapi—and, as a matter of course, more so than the Giraffe—in the non-fusion of the five tarsal bones into one, in the comparatively very slight extension of cranial air-sinuses, and in the anterior position of the horns.

*To sum up the state of our present knowledge of the Okapi.*—In the species preserved at Tervueren (*Okapia liebrechtsi*) the male is provided with horns, but the same will presumably prove to be the case in the species represented in the Natural History Museum also.

The mode of formation of the horns of the Okapi is the same as in the Giraffe. In the present state of our knowledge they are limited to the male alone of the former, so that the Okapi is in this respect on the same level as *Palæotragus*, the Giraffe having progressed farther.

Besides the last-mentioned some further features which the Okapi shares with *Palæotragus*, and all of them of a more generalized character as compared with the Giraffe, have been added to those formerly pointed out.

One feature has been added to those formerly mentioned, in which the Okapi occupies an intermediate position between *Palæotragus* and the Giraffe.

And, lastly, we have been able to adduce some characters in which the Okapi appears to be even more generalized than *Palæotragus*. It is this last category especially which adds weight to the assumption that Africa was the original home of the Giraffidæ.

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December 2, 1902.

Dr. HENRY WOODWARD, F.R.S., Vice-President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of November 1902:—

The registered additions to the Society's Menagerie during the month of November 1902 were 68 in number. Of these 41 were acquired by presentation and 1 by purchase, 1 was born in the Gardens, 21 were received on deposit and 4 in exchange. The total number of departures during the same period, by death and removals, was 115.

Amongst the additions special attention may be called to a fine

adult female of the Equine Antelope (*Hippotragus equinus*), from Bechuanaland, presented by Major Charles Frederick Minchin, D.S.O. No specimen of this Antelope has been received in the Society's Gardens since 1878, and it is now becoming very scarce in South Africa.

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Mr. Sclater called attention to the specimen of the Greater Bird of Paradise (*Paradisea apoda*), now living in the Society's Gardens, which had been received from the Zoological Gardens, Calcutta, on the 15th June, when it was in full dress. It had begun to moult at the end of June, and had shed all its plumes in *three nights*. (The bird was not observed to cast any plumes during the day.) The bird did not commence to cast its flight-feathers till the beginning of August, and it cast about two feathers per week up to the beginning of November. The *new* plumes began to show about the last week in August. The bird had now completed its moult, and was in fine health and condition. It was very tame and lively, and came readily to be fed by hand. It was fed upon boiled rice, boiled potatoes, boiled carrots, boiled eggs, bread, maw-seed, and German paste, also on bananas, grapes, pears, and nuts. It has one *raw* fresh egg per week, a fresh-killed mouse occasionally, and had all the damaged moths in the Insect-house. Of the last-named the bird was particularly fond, as also of small pieces of sweet biscuits.

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Mr. F. E. Beddard, F.R.S., exhibited the lower jaw of a Wombat which had died in the Society's Gardens, apparently from peritonitis. The molar teeth on both sides of the jaw had grown inwards so as to confine the tongue below them. Though it was possible to free the tongue by bending it sideways and then pulling it out, it seemed doubtful whether this could have been done by the animal itself during life, or, if so, whether it could have been replaced as it was found after death. The uselessness of the tongue as an aid to mastication must not be assumed from the conditions observable in this specimen, since it is quite conceivable that the organ may have been paralyzed, and thus rendered it possible for the teeth to close in above it. The animal was old, having been acquired in 1885.

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Dr. Hans Gadow, F.R.S., gave an account (illustrated by lantern-slides) of his recent expedition to Southern Mexico. He described the Valley of Mexico, and discussed the question of the Axolotls and their metamorphosis. He also gave an account of his ascent of the Volcano of Orizaba—on which he camped for several weeks at various high altitudes,—and of the two types of *tierra caliente* met with on the Atlantic and Pacific slopes, and pointed out the various phases of animal life seen by him in these different districts.

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The following papers were read :—

1. On the Variation of the Elk (*Alces alces*).

By Dr. EINAR LÖNNBERG, C.M.Z.S.

[Received November 4, 1902.]

(With Text-figures 68-76.)

In Sweden it is not uncommon to hear professional elk-hunters talk of "two kinds of Elk," distinguished as follows:—The one is dark blackish-brown in colour, short-legged, and provided with broadly palmated antlers. It is also said to be less shy and more apt to "make a stand" against dogs when hunted than the other, and, as a rule, is fatter and more fleshy. The second is said to be a longer-legged and more slenderly built animal, of a lighter colour, more especially on the legs, which are described as almost whitish. It is usually more shy, and thus more difficult to approach with dogs when hunted. The antlers are deeply cleft, with little or no palmation, and end in long rounded tines. In some districts hunters distinguish these two forms by distinct names, as, for instance, "grass-elk" and "mountain-elk," and report that they frequent different localities; but the statements on this point are rather vague and contradictory, and it is questionable to how much reliance they are entitled.

To some extent, at any rate, the above-mentioned variations may be due to difference of age—an old bull, for instance, being more apt to resist dogs than a younger animal. The difference in colour might also be attributed to the same cause; and the statements about longer or shorter legs are of no value unless supported by exact measurements, a fat and bulky individual appearing shorter-legged than a more slender animal with limbs of the same length. Sportsmen, on the other hand, who concentrate their interest on the trophies they carry home, devote special attention to the antlers; and it has accordingly become a custom among them to speak about "cervine" as opposed to "palmate" antlers in Elk. Antlers of both types, as well as intermediate forms, have been shown at several exhibitions, and may also be seen in private collections in Sweden. In the Baltic Provinces especially, sportsmen have noticed the variation of Elk, and in the 'Baltische Waldmannsblätter' for 1901 the question has been raised whether there are one or two kinds ("races" or "species") of Elk in these countries; some writers maintaining that there are certainly two forms—the one with broad shovels (palmations) to the antlers, the other without palmation to these appendages, which terminate in long simple tines. The Elk with palmated antlers is said to be somewhat earlier in rutting and cleaning and shedding its antlers than the other. Some sportsmen believe that the non-palmated Elk has immigrated from the north-east into Estland and Livonia; others, however, deny the immigration theory, and consider the



non-palmated Elks to be degenerate stags. The latter theory accounts both for the difference in external appearance and for the difference in the breeding-time, &c. ; an elk in its prime being always earlier than a degenerate animal in rutting and shedding. From the department of Grodnö, Elk with and without palmation, as well as intermediate forms, have also been reported. Some elk-antlers from the Ural are said to be fully palmated, while others are of the intermediate type.

The interest in regard to the variation of the Elk has, however, been intensified during the present year, owing to the circumstance that Mr. Lydekker (Proc. Zool. Soc. 1902, vol. i. p. 107) has named a new species (*Alces bedfordiae*) from Siberia, the chief characteristic of which is the non-palmated antlers. Knowing how much the Swedish Elk varies in regard to its antlers, it has seemed to me that the type of antler displayed by *Alces bedfordiae* falls within the range of variation of the common Elk, and I have therefore contributed the following notes to the Society. They are based on the study of a large number of elk-antlers from different parts of Sweden ; and I have this autumn specially studied no less than 32 elk-heads sent to Mr. G. Kolthoff's establishment in Upsala to be mounted. From these I have selected nine, figures of which are here photographically reproduced on the same scale. Three of these pairs belong to the true "palmate" type, three to the "cervine" type, and two to the intermediate, while one is anomalous. The "palmate" and "cervine" antlers have been so selected as to form two series, each of the three specimens representing different ages. The two "intermediate" specimens belong to adult animals which ought to have their characteristics fully developed. All the heads belonged to Elk shot this autumn in the eastern part of Central Sweden within the following limits : namely, from the central district of Gestríkland in the north, to northern Östergötland in the south and to Nevike in the west<sup>1</sup> ; all being thus within a small area for such a widely distributed animal as the Elk. Climatic and other physical conditions do not vary much within the area in question ; and the variation in the different specimens is therefore all the more striking.

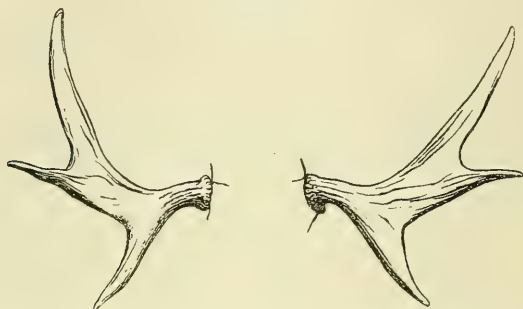
The palmated series is represented by text-figs. 68-70. Text-fig. 68 shows the youngest pair, which has not developed more than three times to each antler, but displays, nevertheless, a rather broad palmation for such an early stage. This pair is from Upland. Text-fig. 69 represents a somewhat older pair from Finspång in Northern Östergötland. The posterior or upper palmation is well developed, with four points on the right and five on the left. The anterior branch displays two points and an incipient palmation on the right side, but only a strong tine on the left. Text-fig. 70 (p. 355) shows the antlers of a still older and better developed stag, with large posterior as well as anterior palmations. The latter have

<sup>1</sup> These limits may also be expressed in the following way :—Northern limit 60° 40' N. ; Southern 59° 30' N. ; Western about 15° E. (Greenwich).



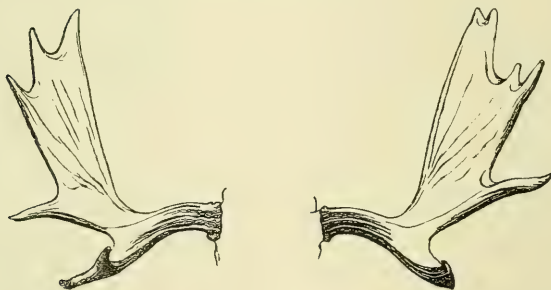
four points on either side, the former four points on the right and five on the left side. This Elk was shot near Sandriken's iron-works in Gestrikland.

Text-fig. 68.



Antlers, of the palmated type, of young Elk from Upland.

Text-fig. 69.



Antlers of a somewhat older Elk than that shown in text-fig. 68, from Finspång, Östergötland.

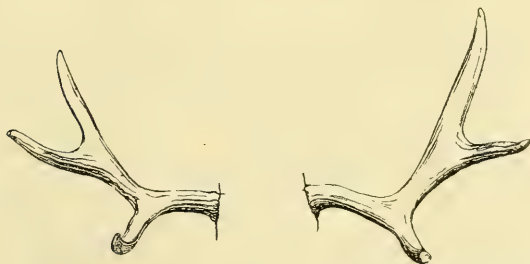
The non-palmated or "cervine" series is represented by text-figs. 71-73. Text-fig. 71 shows three symmetrical points, viz., an upper or posterior fork, and an anterior simple tine, on each side, but no palmation; it may be compared with text-fig. 68 as being probably of the same age. It is taken from an Elk shot in the central part of Östergötland. Text-fig. 72 displays four points on each side, viz., an upper and an anterior fork; it is from Gimo in Eastern Upland. Text-fig. 73 (p. 356) shows the "cervine" type of antlers of an old stag shot at Krusenbergs in Upland, not far from Upsala. The upper or posterior portion of the left antler has three, and that of the right four large points. The anterior portion of both antlers is formed by a greatly developed fork, the long median branches of which are, however, not fully shown in consequence of their inclination towards the camera. The intermediate forms represented by text-figs. 74 & 75 speak for themselves. Text-fig. 74 might

Text-fig. 70.



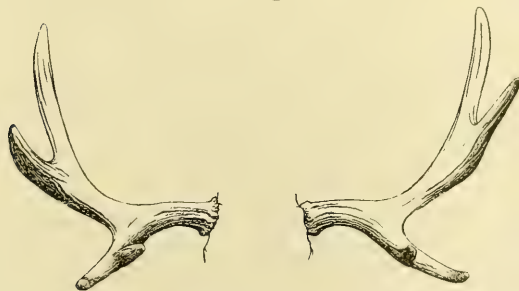
Fully-developed antlers, of the palmated type, of adult Elk from Gestrikland.

Text-fig. 71.



Antlers, of the "cervine" type, of young Elk from Östergötland.

Text-fig. 72.



Antlers of a somewhat older Elk than that shown in text-fig. 71,  
from Gimo, Upland.

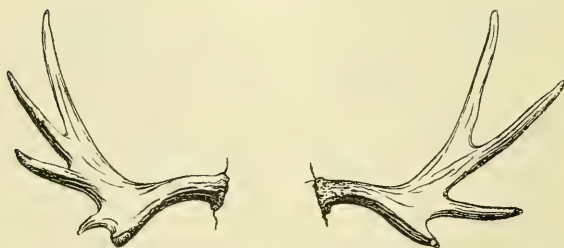
perhaps be termed palmated, but the points are very long and the palmations narrow; it is from the neighbourhood of Katrineholm in Södermanland. Text-fig. 75 (p. 357) displays on the right antler a narrow posterior palmation, with three long points, and a still narrower anterior palmation with two points. The left antler has the same number of points, but is rather more "cervine" in

Text-fig. 73.



Antlers, of "cervine" type, of adult Elk from Krusenberg, Upland.

Text-fig. 74.



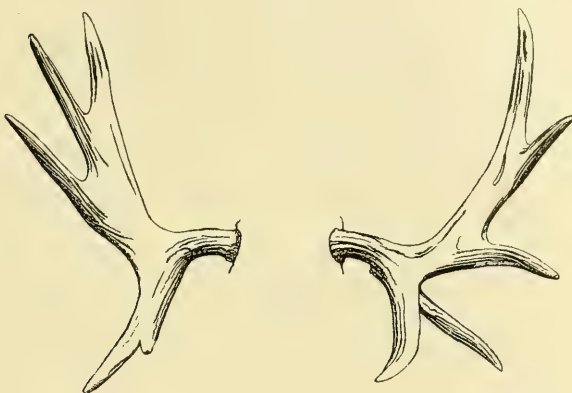
Antlers, of intermediate type, of young Elk from Katrineholm, Södermanland.

appearance. This specimen is from Vretstorp in Nerike. Text-fig. 76 (p. 357) is still more interesting, because while the right antler is palmated, although not much so, and carries rather long tines—three on the posterior palmation and one anteriorly,—the left antler is perfectly "cervine," with three long rounded tines and no palmation. This Elk was shot in Vestmanland at Fellingsbro. Another pair that I have seen does not properly belong to any of these types, since the left antler is anomalous, and shows a tendency to what Nitsche<sup>1</sup> calls "Stangentheilung." It affords, however, a further proof of the great variability of elk-antlers.

<sup>1</sup> Studien über Hirsche, Hft. i. (Leipzig, 1898).

The variability of the antlers is not fully elucidated by these nine specimens; and a number of other variations might be shown, scarcely any two Elk having antlers of precisely the same shape. It must, however, suffice to mention only a few more. An Elk from Karlsboga shows broad palmations, with seven

Text-fig. 75.



Antlers of somewhat older Elk than that shown in text-fig. 74, from Vretstorp, Nerike.

Text-fig. 76.



Antlers of Elk from Vestmanland, Fellingsbro, showing palmated type in right and cervine type in left antler.

almost equal and undivided tines in the posterior and anterior portions. In another Elk, from Kolsva in Vestmanland, on the contrary, the antlers are divided into an anterior and a posterior palmation; both of the same breadth, 14-15 cm., and with three points each. Occasionally, although not often, it happens that

the anterior palmation is larger than the posterior. Sometimes, again, the anterior portion of the antler is bent so as to form more or less nearly a right angle with the posterior palmation; and occasionally the two points of a fork do not lie in the same frontal plane, but one behind the other.

These instances must suffice to show the great variability in the form of elk-antlers, and at the same time to indicate that in Sweden no division into subspecies or races can be founded on such differences, at any rate for the present. It is true that sometimes in a particular district most of the Elk display antlers of the same type; but this is easily explained by the close relationship of the individuals, so that only family groups are formed, and no greater differentiation is indicated.

In order to show the dimensions of the antlers, and to indicate that these also vary greatly, the following table has been drawn up, the heads measured being enumerated in the same order as described above:—

	Frontal breadth between the burr of the antlers.	Circumference of the antlers just above the burr.	Distance between the uppermost tines.	Greatest width between the two most dis- tant points.
	mm.	mm.	mm.	mm.
No. 1 .....	194	152	920	995
2 .....	209	180	870	1105
3 .....	182	182	850	1040
4 .....	187	145	890	1020
5 .....	179	175	905	965
6 .....	205	215	1135	1330
7 .....	194	156	975	1100
8 .....	177	165	860	1035
9 .....	80 + 40 <sup>1</sup>	180	870	1105
10 .....	165	175 <sup>2</sup>	905	965

From these measurements it will be seen that the dimensions of skull and antlers are subject to a comparatively great variation, and that, for instance, a smaller frontal width may be united with large antlers, and *vice versa*. It is also apparent that the antlers of the "cervine" or "intermediate" types reach dimensions approximately equal to, and sometimes indeed superseding, those of the "palmated" type. The "cervine" and "intermediate" types cannot therefore be said to be the result of degeneration in the strict meaning of that word. By this I do not intend to imply that there are no degenerate elk-antlers to be found in Sweden, since such small and degenerate antlers frequently occur. These, however, include "palmated," "intermediate," and "non-palmated" types, although the latter may be the more numerous.

From the more southern provinces especially (such as Småland),

<sup>1</sup> A teratological continuation from the burr of the right side covers a good deal of the frontal. The distance from the left burr to the median line is about 80 mm.: if normal the breadth should thus have been 160 mm.

<sup>2</sup> On the normal side.



I have seen many antlers which might be termed degenerate. The cause of this degeneration may in some cases be insufficient food and poor pasture, but oftener still in-breeding and excessive hunting, or inadequate game-laws. Frequently all the adult stags are shot, so that young males are allowed to breed, which naturally results in weak offspring. In some places it is permitted to kill hinds during the shooting-season, although unlawful to harm the fawns, despite the fact that a fawn of which the mother has been killed will be weak and degenerate. There is thus little wonder that a degenerate stock with small antlers is produced in such districts. This, however, is quite different from claiming all "cervine" and "intermediate" antlers as degenerate. Such a statement is at once disproved by the measurements given above.

The "cervine" and "intermediate" antlers may rightly be termed products of spontaneous variation (not of degeneration), and a glance at many of them reveals the fact that this variation, in a certain sense at least, has gone in a particular direction. The antlers of the Elk are chiefly used as weapons against rivals during the rutting-season. It is therefore apparent that the long sharp tines of the "cervine" and "intermediate" types will be more useful for fighting than the comparatively short points of the extremely palmated type. The bayonet-like and forwardly-directed anterior tines of the former are especially formidable; and it will be evident that the best-armed animal will be victorious, and that when the form of the antlers becomes hereditary in certain localities, Elk with "cervine" antlers must dominate over those with "intermediate" antlers. At the last exhibition in Stockholm (1902) of antlers, from the period 1897-1901, this was proved by a collection of thirteen pairs of heads from eastern Upland, twelve of which were perfectly "cervine," although the thirteenth was broadly palmated. From Vestmanland, again, there was a collection of antlers, chiefly of the "intermediate" type, with narrow palmation and long points. If such family groups live isolated through many generations, it is possible that their characteristics would become constant, but as yet they are not; and since Elk, especially when disturbed, often wander from one tract to another, isolation cannot be effected in districts where they are not yet too scarce<sup>1</sup>. The Swedish Elk with all its variations thus constitutes only one species, although possibilities seem to exist for the origin of different racial types.

Considering the nature of the "cervine" type of elk-antlers, it might in a certain sense be said that it is atavistic, since rounded tines are more primitive than a broad palmation. But, on the other hand, the antlers classed above as "cervine" may be regarded as forming a continuous and direct development of the immature type displayed by the young elk, which in its third year normally carries only a fork on each side. It is also important to note that Elk show a strong tendency to continue

<sup>1</sup> At present Elk are fairly numerous in Sweden, as may be gathered from the fact that last year during the shooting-season more than 2400 were killed.

with their antlers in this forked stage. The antlers, in such cases, only become heavier each year, and show longer tines without developing new points. A similar tendency to remain in the three-pointed stage is also apparent. The forked and three-pointed stages are indeed the starting-points from which the palmated and non-palmated antlers diverge and develop in different directions. The forked stage of the immature antler with rounded tines may to a certain extent be regarded as a repetition of the phylogenetic development, so that in this way the "cervine" elk-antler, whether it be called a development of the young stage or a reversion, displays primitive characteristics in its rounded tines. This must not, however, be understood to mean that I infer that the nearest ancestors of the common Elk had antlers of exactly the same type as those here termed "cervine."

Finally, I will only remark that an Elk with the antlers so well developed as text-fig. 73 (p. 356) is still at its most vigorous age, as a glance at its dentition is sufficient to indicate. The incisors are not so worn but that they form a continuous edge, with the outer broad ends fully in contact with each other. In the same way the molars do not look much worn, the accessory columns of the upper ones being perfectly intact.

## 2. Note on a Reindeer Skull from Novaia Zemlia.

By R. LYDEKKER.

[Received November 15, 1902.]

(Text-figure 77.)

By the courtesy of Mr. H. J. Pearson, F.Z.S., of Bramcote, Notts, in whose possession is the specimen, I am enabled to bring to the notice of the Society a Reindeer's skull, with a remarkably fine pair of antlers, obtained by that gentleman from the top of a Samoyed's hut in Novaia Zemlia in 1895. The specimen has already been figured, with a brief description, by the owner in his 'Beyond Petsora Eastward' (1899); but its interest is such that I have no hesitation in bringing it more prominently into notice.

The antlers are characterized by the great development and palmation of both the brow- and bez-tines, which are, however (unlike the majority of American Reindeer), not very unequal in size. The beam is of medium length and carries a very large back-tine; above the latter there is a large palmation, most developed on the left side, terminating in a number of irregular snags. The length of the antlers, from base to tip, along the curve is 49 inches; the palmation of the larger of the two brow-tines has a vertical depth of 16 inches, its fellow  $11\frac{1}{2}$  inches.

That these antlers are quite unlike those of the Scandinavian Reindeer (or, at least, any that have come under my own observation) is apparent at a glance. They are less unlike those of

the Spitzbergen Reindeer, of which a head is figured in Murray's 'Geographical Distribution of Mammals,' p. 154, fig. 9<sup>1</sup>. In that race the antlers are smaller and lighter, usually with less palmation of the brow-tine, and with the bez-tine simple. The summit of the antler is, moreover, devoid of palmation.

In the Siberian Reindeer (*Rangifer tarandus sibiricus*) as typified by the heads figured in Murray's 'Geographical Distribution of Mammals,' p. 153, the palmation of the brow- and bez-tines is less marked than in the present specimen, and in one case at least these tines are unsymmetrical. The same condition obtains in the antlers of a Reindeer skull in the British Museum from "Siberia" which approximates to the American woodland race.

Turning to American Reindeer, or Caribou, of which a great number of local phases are now recognized, the Novaia Zemlian specimen seems to me to come nearest as regards relative length of antlers to forms like the Alaskan *Rangifer tarandus stonei*<sup>2</sup>, intermediate between the true woodland and the true barren-ground type. The present antlers differ, however, markedly from those of the Alaskan race by the much greater palmation of the summit, the much more developed back-tine, and the greater symmetry between the brow- and bez-tines of opposite sides. From *R. t. osborni*<sup>3</sup>, of the Cassiar Mountains—another of the intermediate types—they differ by the smaller length of beam, as well as in the greater palmation, although both show a large back-tine. From *R. t. montanus*<sup>4</sup>, which more closely resembles the woodland type, as well as from the true woodland, the Newfoundland, and the barren-ground races, the Novaia Zemlian form is markedly distinct, although it is decidedly nearer to the woodland than to the barren-ground type.

On these grounds, coupled with its insular habitat, I feel little hesitation in regarding the Novaia Zemlian Reindeer as forming a distinct local race (American naturalists would probably consider it a species); and I propose to call it *Rangifer tarandus pearsoni*, after the owner of the type specimen here figured. It may be briefly characterized as distinguished from other Old World forms of Reindeer by the symmetry of the antlers and the excessive palmation of both their brow- and bez-tines and their summits. I may add that Baron Nordenskiöld has suggested that the Novaia Zemlia Reindeer reach that island from more northern lands by crossing the ice.

I regret to say that Mr. Pearson is at present unwilling to part with the type specimen; but it may be hoped that he will make arrangements whereby it will eventually come to the National collection.

Mr. Pearson informs me that the animal to which the type skull belonged was killed in the winter of 1894-95, near the hut

<sup>1</sup> The antlers figured by Camerano, Mem. Ac. Torino, vol. li. pl. ii. (1901), are stated by Winge (Meddelelser om Grönland, vol. xxi. p. 457) to come from Greenland.

<sup>2</sup> See J. A. Allen, Bull. Amer. Mus. vol. xiv. p. 145 (1901).

<sup>3</sup> Allen, *op. cit.* vol. xvi. p. 149 (1902).

<sup>4</sup> Allen, *loc. cit.*

where he found the latter. He believes that in Novaia Zemlia, where they will probably ere long be exterminated, Reindeer do not lose the velvet from their antlers until about the time navigation closes, so that sportsmen from the south have no opportunity of shooting them in proper condition unless by

Text-fig. 77.

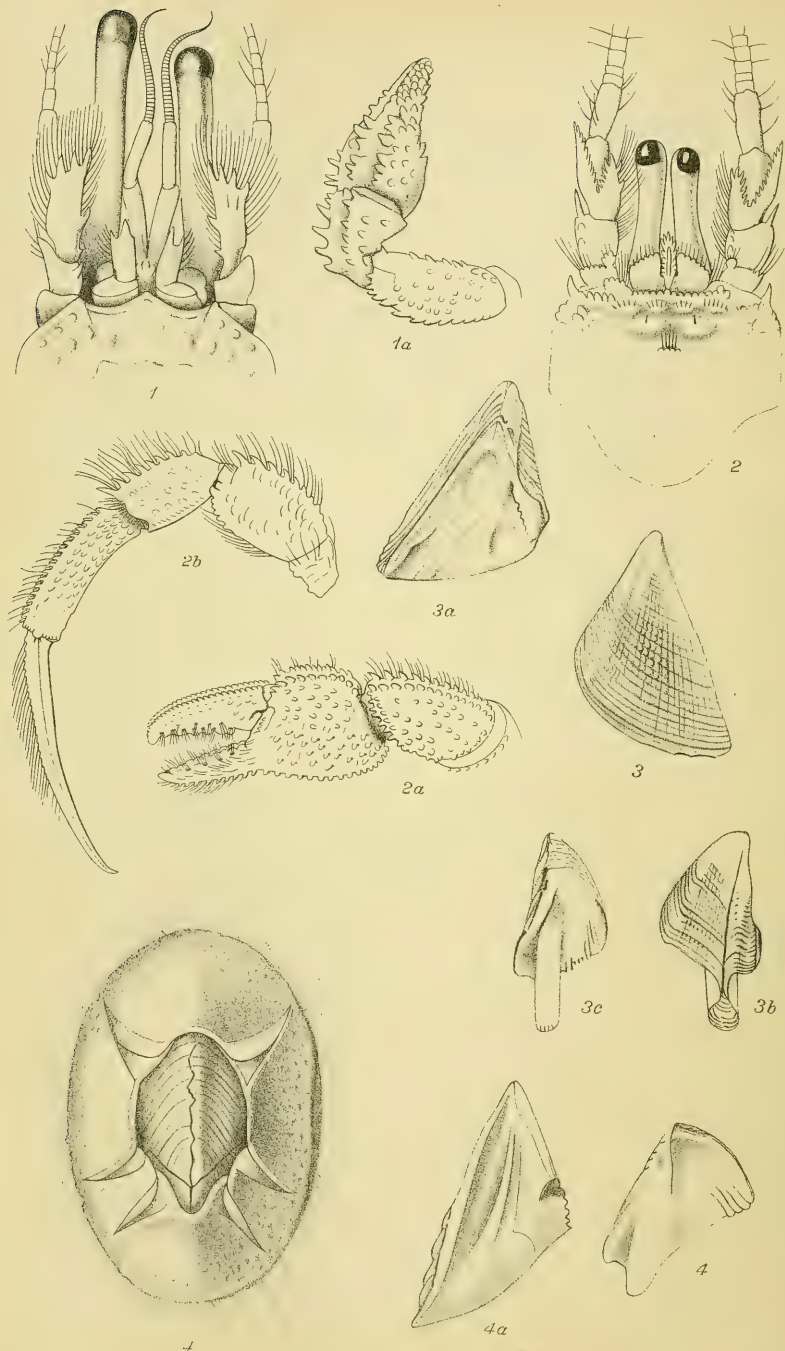


Skull and antlers of male Novaia Zemlian Reindeer (*Rangifer tarandus pearsoni*), from the type specimen in the possession of Mr. Pearson.

wintering on the island. Mr. Pearson adds that in 1897 he saw on the east side of Novaia Zemlia one or two pairs of cast antlers with brow- and bez-tines nearly as large as those of the type specimen.

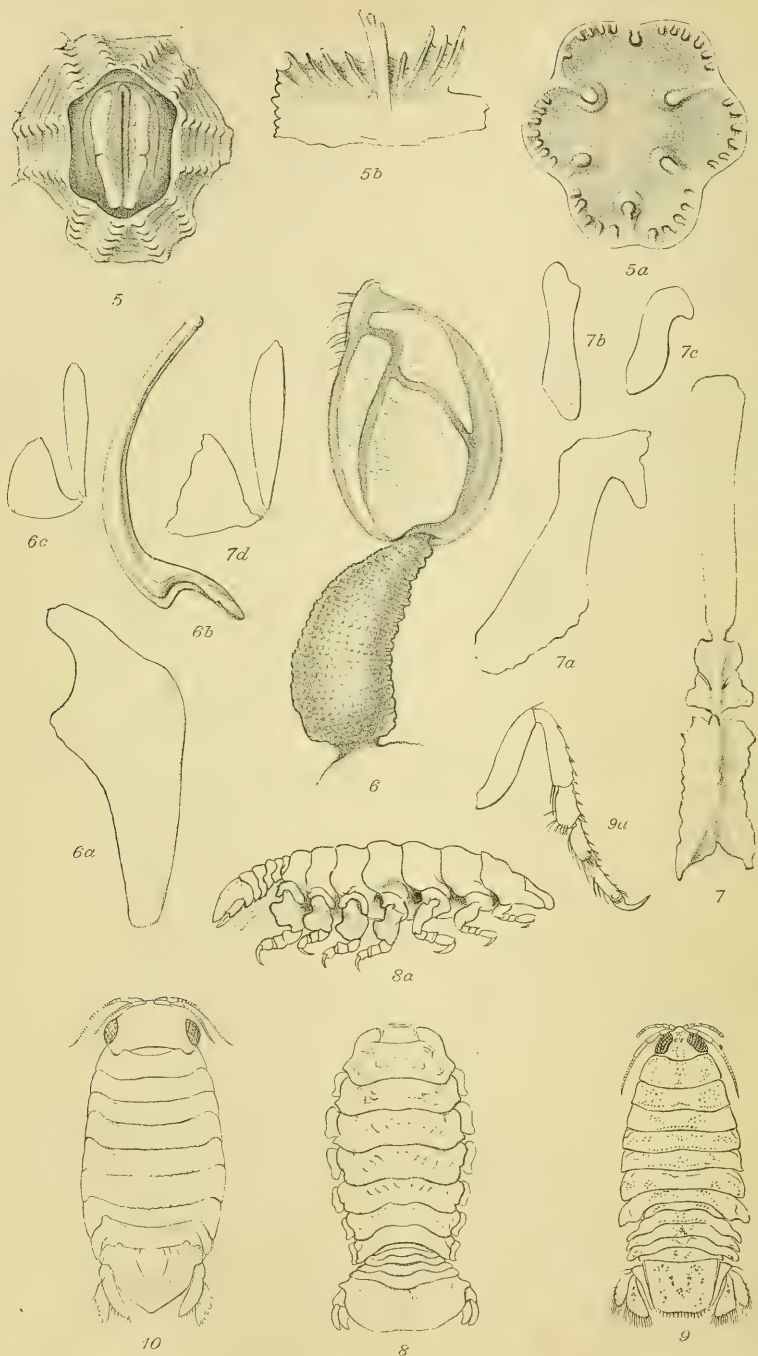






Edwin Wilson, Cambridge





Edwin Wilson, Cambridge.

3. On the Crustacea collected during the "Skeat Expedition" to the Malay Peninsula. By W. F. LANCHESTER, M.A., King's College, Cambridge<sup>1</sup>.

[Received October 14, 1902.]

(Plates XXXIV. & XXXV.<sup>2</sup>)

## PART II.<sup>3</sup>—ANOMURA, CIRRIPIEDIA, AND ISOPODA.

The species represented in the above-mentioned groups, in this collection, number 35 (not including the land Isopods), comprised in 20 genera; of these 6 species are described as new, 2 among the Anomura and 4 among the Cirripecta; in addition to which I have given names, among the Anomura, to one colour-variety, and, among the Cirripecta, to one subspecies and a colour-variety of that subspecies. In the latter case it will be seen that a single form has been burdened with four names, a proceeding which will not, I fear, find favour with many systematists; I have, however, given my reasons for so doing under the description of the form in question, and will only say here that I have not acted under any preconceived ideas on the general question of a quadrinomial nomenclature, but rather from the exigencies of the special case before me.

Besides the marine Isopods herein described, there are in the collection some 10 species of land Isopods; many of these appeared to me, on examination, to be as yet undescribed. At the same time it seemed to me advisable to have the opinion of a specialist in this difficult group, and I therefore applied to M. Budde-Lund, of Copenhagen, who very kindly undertook to examine the specimens, and who tells me that "several of them are not described, but I have the descriptions and drawings laying by from other collections." These species, then, will be included by M. Budde-Lund in a more general account of the land Isopods of the Malay Peninsula, to be published later on in these 'Proceedings.'

### A. ANOMURA.

#### I. Genus PETROLISTHES Stimpson.

##### 1. PETROLISTHES SPECIOSUS Dana.

*Porcellana speciosa* Dana, U.S. Expl. Exp. p. 417, pl. xxvi. fig. 8 (1852).

*Petrolisthes speciosus* Ortmann, Zool. Jahrb. Syst. vi. p. 262 (1892).

*Loc.* Pulau Bidan, Penang. A female.

<sup>1</sup> Communicated by Dr. S. F. HARMER, F.Z.S.

<sup>2</sup> For explanation of the Plates, see p. 381.

<sup>3</sup> For Part I. see P. Z. S. 1901, vol. ii. p. 534.

## 2. PETROLISTHES BOSCHII Aud.

*Porcellana boschii* (Aud.), Sav. Descr. de l'Egypte, Crust. pl. vii. fig. 2 (1819).

*Petrolisthes boschii* de Man, Mergui Crust. p. 217 (1888).

*Loc.* Pulau Bidan, Penang. A male.

## II. Genus PORCELLANELLA White.

## 3. PORCELLANELLA PICTA Stimpson.

*Porcellanella picta* Stm. Proc. Ac. Nat. Sci. Philad. p. 243 (1858); de Man, Mergui Crust. p. 220 (1888).

*Loc.* Pulau Bidan, Penang. Two specimens.

## III. Genus ANICULUS Dana.

## 4. ANICULUS ANICULUS Fabr.

*Pagurus aniculus* Fabr. Ent. Syst. Suppl. p. 411 (1798).

*Aniculus typicus* Dana, U.S. Expl. Exp. p. 461, pl. xxix. fig. 1 (1852).

*Loc.* Kelantan. Two specimens.

## IV. Genus SPIROPAGURUS Stimpson.

## 5. SPIROPAGURUS SPIRIGER de Haan.

*Pagurus spiriger* de Haan, Crust. Japon. p. 206 (1839).

*Loc.* ———? A female.

## V. Genus PAGURUS Fabr.

## 6. PAGURUS HESSII Miers.

*Pagurus hessii* Miers, 'Alert' Crust. p. 264 (1884); Henderson, Trans. Linn. Soc. (2) Zool. v. p. 419 (1893).

*Pagurus similimanus* id. 'Challenger' Anomura, p. 59 (1886).

*Loc.* Pulau Bidan, Penang.

One from *Strombus*, with an anemone fixed in the mouth of the shell, one from *Natica* (both these shells with *Balanus aneus*, vide infra), two from *Murex*.

*Loc.* ———? One from *Ranella*.

The antennular peduncles are just longer than the eye-stalks, as stated by Henderson.

## 7. PAGURUS PUNCTULATUS Olivier.

*Pagurus punctulatus* Oliv. Encycl. Méth. viii. p. 641 (1811); Ortmann, Zool. Jahrb. Syst. vi. p. 286 (1892).

*Loc.* Pulau Bidan, Penang. One large specimen.

*Loc.* Kota Bharu, Kelantan. A small specimen from *Conus*.



## VI. Genus EUPAGURUS Brandt.

## 8. EUPAGURUS LACERTOSUS var. NANA? Henderson.

*Eupagurus lacertosus* var. *nana* Hend. 'Challenger' Anomura, p. 64, pl. vii. fig. 1 (1886).

An ovigerous female, from *Trochus*.

The absence of the chelipedes in this specimen makes its identification a little uncertain. But the frontal, ocular, and antennal regions have exactly the structure of Henderson's variety, though the ambulatory legs are without the spines on the carpal joints.

## VII. Genus CLIBANARIUS Dana.

## 9. CLIBANARIUS CORALLINUS Milne-Edw.

*Pagurus corallinus* M.-E. Ann. Sci. Nat. (3) x. p. 63 (1848); Ortmann, Zool. Jahrb. Syst. vi. p. 292 (1892).

Loc. Kota Bharu, Kelantan. Two small specimens.

## 10. CLIBANARIUS ÆQUABILIS var. MERGUIENSIS de Man.

*Clibanarius æquabilis* var. *merguiensis* de Man, Mergui Crust. p. 247 (1888).

Loc. —? Two specimens.

## 11. CLIBANARIUS LONGITARSIS de Haan.

*Pagurus longitarsis* de Haan, Crust. Japon. p. 211, pl. l. fig. 3 (1839); de Man, Arch. f. Naturg. liii. p. 441 (1887).

Loc. —? Two specimens, from *Telescopium*.

## 11 a. CLIBANARIUS LONGITARSIS, var. TRIVITTATA nov.

Loc. —? A male.

This form agrees so entirely in structural peculiarities with the above-mentioned species that it can only be considered as a colour-variety. On the posterior surfaces of the legs there are three broad white bands (broader than in *C. striolatus*), and three slightly narrower red bands; on the anterior surfaces there are two white and two red bands, the banding, however, being much less definite.

## 12. CLIBANARIUS STRIOLATUS Dana.

*Clibanarius striolatus* Dana, U.S. Expl. Exp. p. 463, pl. xxix. fig. 3 (1852); Ortmann, Zool. Jahrb. Syst. vi. p. 290 (1892).

Loc. Pulau Bidan, Penang. A female, from *Strombus*.

Loc. —? Seven specimens from *Cerithium*.

Loc. Patani. One specimen from *Murex* with *Balanus amphitrite*.

## VIII. Genus DIOGENES Dana.

## 13. DIOGENES PLANIMANUS Henderson.

*Diogenes planimanus* Henderson, Trans. Linn. Soc. (2) v. p. 416, pl. xxxix. fig. 5 (1893).

Loc. —? Three specimens from *Murex*, with anemones.

*Loc.* Patani. Five specimens from *Natica*, with anemones.

The flagella of the antennæ are fringed along their whole length with longish hairs; this point is not noticed by Henderson in his description or figure.

14. *DIOGENES RECTIMANUS* Miers.

*Diogenes rectimanus* Miers, 'Alert' Crust. p. 262, pl. xxvii. fig. C (1884).

*Loc.* —? One small specimen from *Murex*, and several, very small, from shells of *Rissoa*, *Gibbula*, and *Neritina*.

The largest specimen has the carapace only  $4\frac{1}{2}$  mm. long, and large chelipede only 9 mm. long: to their small size it is probably due that the spines on the lower border of the hand of the larger chelipede are scarcely prominent, while the arrangement of the granules on this leg is more obscure.

15. *DIOGENES SENEX* Heller.

*Diogenes senex* Heller, 'Novara' Reise, Crust. p. 85, pl. vii. fig. 3 (1865).

*Loc.* Pulau Bidan, Penang. A female, with ova, from *Murex*.

I cannot discover the ophthalmic process in this specimen, but it is probably safer to consider it as having been accidentally broken off, for otherwise the resemblance of the specimen to Heller's description and figure is complete; the hands only of the larger chelipede and the ambulatory legs would seem to be even more densely hairy than as shown in his figure.

16. *DIOGENES DESIPIENS*, sp. nov. (Plate XXXIV. figs. 1, 1a.)

*Loc.* Pulau Bidan, Penang. A male, from *Cancellaria*.

This species is characterized at first sight by its extremely short, broad ophthalmic process, and the great hairiness of the legs and under surface of the body.

The anterior portion of the carapace just behind the front (which is raised into a smooth distinct ridge) is covered with large, coarse, somewhat scattered granules over a small area; behind this area is a deep, transversely-placed groove, convex towards the front and not continued towards the lateral margins, behind which groove the carapace is smooth, except for the very narrow portion enclosed within the groove, which is coarsely punctate. The sides of this part of the carapace are thickly hairy, and rough granulate (almost rugose posteriorly) beneath the hairs; the branchial regions are somewhat swollen, smooth, with a few longish hairs; the V-shaped suture of the gastric region is distinct. The rostrum is bluntly pointed, triangular, with a broad base, and reaches as forward as the lateral teeth; between these and the rostrum the front is concave.

The ophthalmic scales are longer than broad, and rounded distally where they carry some long hairs; the ophthalmic process is short and broad, reaching barely halfway along the scales, with its anterior edge microscopically denticulate. Ocular peduncles

long and slender, as long as antennular, much longer than antennal, peduncles. The antenna is very short, the peduncle (armed with long hairs) a little longer than half the eye, the flagellum only overreaching the eye by half its own length, thinly ciliated. The antennal scale is a broadish ovoid plate, fringed with long hairs, and falling short of the end of the antennal peduncle by some little distance.

The chelipedes are subequal, the right being slightly the larger; in other respects they are quite similar. The whole leg is very hairy, except on the inner surface, and a part of the outer surface, of the merus, the hair being very dense on the outer surfaces of the carpus, hand, and fingers, slightly less so on their inner joints. In the merus, the outer surface bears a few separate granules, the inner is smooth; both lower and outer margins are denticulate, the lower more distinctly so. The carpus carries a row of four large teeth on its upper margin, of which the 3rd, counting proximo-distally, bears a secondary tooth at its base internally; on its outer surface is a row of 5-6 teeth of varying size: between these two rows the carpus is somewhat hollowed proximally, and distally it bears, close to the joint, a small patch of low teeth. The hand is short and very swollen, especially on its inner surface, not longer than the fingers; its outer surface and upper and lower margins carry a few tubercular spines in three irregular rows, the row on the outer surface being the least definite: the fingers are everywhere (except their inner edges) covered with coarse, large granules, the tips corneous, faintly excavate. The ambulatory legs are densely hairy on their upper and lower margins, otherwise smooth; the dactyli a little longer than the penultimate joint.

17. *DIOGENES MIXTUS*, sp. nov. (Plate XXXIV. figs. 2-2 b.)

*Loc.* Pulau Bidan, Penang. Numerous examples from *Natica*, *Murex*, and other shells.

*Loc.* Patani. One from *Murex*.

This species is closely allied to *D. miles* Fabr., *D. merquiensis* de Man, and *D. intermedius* de Man; and it has seemed to me best to arrange the main points in which these species agree or differ in tabular form:—

	<i>D. miles.</i>	<i>D. merquiensis.</i>	<i>D. intermedius.</i>	<i>D. mixtus.</i>
<i>a. Merus of 3rd legs.</i>				
Numerous large spines on upper border.	Spines less numerous and smaller.	Spines absent.	As in <i>D. miles</i> .	
<i>b. Outer surface of joints of 3rd legs.</i>				
Numerous small piliferous granules.	Less numerous, larger, and more piliferous granules.	Scarcely granular. Merus nearly smooth.	As in <i>D. intermedius</i> , but a row of piliferous granules a little below the upper margin of penultimate joint.	

<i>D. miles.</i>	<i>D. merguiensis.</i>	<i>D. intermedius.</i>	<i>D. mixtus.</i>
<i>c. Hand and Carpus.</i>			
Much as in <i>D. merguiensis</i> , but tubercles less prominent and more thickly placed. Two rows as in <i>D. merguiensis</i> .	Two rows of 11-12 granules, and numerous pili-ferous acute tubercles on carpus. Palm similar, but the two rows number 8 externally, 5 internally.	Two rows of 11-12 granules, and less numerous granules, with 1-2 hairs at bases only, on carpus. On palm the two rows number 25-27 externally, 10-11 internally.	As in <i>D. intermedius</i> , but, on the carpus, the two rows number 14-15 each, and on the palm 10-11 each.
<i>d. Fingers.</i>			
30 granules in the external row.	16-17 granules.	25-27 granules.	24 granules.
(?)	The row of granules on the under margin of the immobile finger extends as far as the carpal joint.	Row of granules extends partly on to the hand.	As in <i>D. merguiensis</i> .
<i>e. Antennal scales.</i>			
The inner process extends as far as the middle of the penultimate joint.	Inner process extends a little beyond the penultimate joint.	Inner process extends to the anterior $\frac{1}{4}$ of the penultimate joint.	As in <i>D. intermedius</i> .

From this table it may be seen that *D. mixtus* combines some of the characters of the other three species with characters of its own in such a way that it is difficult to regard it as a variety of any one of the other species, and necessary to regard it as a distinct, though closely allied form.

#### IX. Genus CÆNOBITA Latr.

##### 18. CÆNOBITA COMPRESSUS M.-Edw.

*Cænobita compressus* M.-E. Hist. Nat. Crust. ii. p. 241 (1837); Ortmann, Zool. Jahrb. Syst. vi. p. 318 (1892).

*Loc.* Pulau Bidan, Penang. One specimen from *Dolium*, two from *Murex*, one from *Purpura*, and numerous other individuals.

Ortmann's diagnosis is deceptive in so far as the outer surface of the 3rd left leg is not quite smooth in large individuals, but, like the cephalothorax, finely granulated or tuberculated; the short stiff hairs springing from these tubercles in front at the base; the tubercles themselves being sometimes corneous at the tips. The same remark holds good also for some large specimens, in the Cambridge Museum, of *C. rugosus* from Torres Straits. On the last joint, however, in both species, the granulation is confined to the proximal  $\frac{1}{4}$  or  $\frac{1}{5}$  of the joint. Further, the ridge on the outer surface of the penultimate joint becomes rounder, the larger the individual. No doubt these characters are correlated with age.

##### 19. CÆNOBITA RUGOSUS M.-Edw.

*Cænobita rugosus* M.-E. Hist. Nat. Crust. ii. p. 241 (1837); Ortmann, Zool. Jahrb. Syst. vi. p. 317 (1892).

*Loc.* Pulau Bidan, Penang. Two females, one with ova. Also another female, from *Neris*, with a small Ascidian attached to the left sides of the 2nd and 3rd abdominal segments.

20. CÆNOBITA PERLATUS M.-Edw.

*Cænobita perlatus* M.-Edw. Hist. Nat. Crust. ii. p. 242 (1837); Miers, 'Alert' Crust. p. 555 (1884).

*Loc.* — ? Three females, from *Murex*.

Miers has noted (*l. c. supra*) the fact that in this species "there is an oblique row of somewhat more elongated tubercles on the upper surface of the palm, occupying the place of the series of oblique ridges in *C. rugosa*"; such an arrangement I find in these three specimens. But the specimens in question being somewhat small, the tubercles on the legs are noticeably less prominent and less pearly than in typical examples; the carapace also is less rugose.

B. CIRRIPIEDIA.

X. Genus BALANUS da Costa.

21. BALANUS AMPHITRITE Darwin.

*Balanus amphitrite* Darwin, 'Balanidæ,' p. 240, pl. v. (1854).

*Loc.* Patani. On pieces of wood, var. *communis*; on *Murex*, var. *obscurus*; on Lamellibranch shells, var. *niveus*.

*Loc.* Singora. On Lamellibranch shells, var. *obscurus*, and var. *niveus*.

22. BALANUS AMARYLLIS DISSIMILIS, subsp. nov. (Plate XXXIV. figs. 3-3 c.)

? *Balanus amaryllis* var.? Weltner, Arch. f. Naturg. lxiii. 1, p. 270 (1897).

Cf. *Balanus amaryllis* Darwin, 'Balanidæ,' p. 279, pl. vii. fig. 6 (1854); Hoek, 'Challenger' Cirripedia, p. 153 (1883).

*Loc.* Kota Bharu, Kelantan.

This subspecies is represented here by two distinct forms: one, the subspecies itself, of which there are seven large examples; the other a colour-variety, of which there are several smaller examples, attached to pieces of a Gorgonian. These two forms well illustrate the difficulty, which must sometimes arise, of finding a satisfactory place in the binomial system of nomenclature for certain divergent forms. Thus, in the present instance, No. I., though *closely* allied to the species *B. amaryllis*, yet shows sufficiently divergent structural characteristics to be ranked as a distinct variety, if considered alone. But the presence of No. II. necessitates some sort of modification of this conception; for, while exhibiting the same structural divergence, it also differs in colour arrangement: thus it becomes incumbent to form either a subvariety for No. II., or a subspecies for No. I. And in view of the fairly numerous instances in which Darwin has considered colour differences as of varietal worth (vide, e. g.,



*B. amaryllis*, *amphitrite*, *improvisus*), I have been content to follow him in this respect, and to consider No. II. as a *colour-variety* of No. I., the latter being then necessarily regarded as a *subspecies* of *B. amaryllis*. For my justification in separating this form from *B. amaryllis*, I must refer to the differences about to be described.

No. I. = the subspecies.

This form agrees with *B. amaryllis* in all characteristics, whether in structure of shell or structure of body, except those of the opercular valves. These latter, although agreeing in general shape with those of *B. amaryllis*, present the following differences:—

(a) The *scutum*.—Articular ridge prominent, with a very slight tendency to be reflexed to the tergal margin (this is better seen in the large specimens of the subspecies than in the smaller specimens of the variety); adductor crest prominent. These differences have been already noted by Dr. Weltner in his useful Catalogue of recent Cirripede species (*l. c. supra*).

(b) The *tergum*.—Depressor crests well developed; spur, only half its own width from the basiscutal angle.

I think there is no doubt that, apart from No. II., these differences would entitle No. I. to be considered as a variety of the species, and as such I should have classed it, did I not, as I have said, follow Darwin in considering colour difference of varietal worth, so that these differences must be considered as subspecific.

No. II. = var. *clarovittata*.

Presents the same structural distinctions as the subspecies, and differs in the shell being white with rather closely placed longitudinal hyaline lines.

In one specimen of this variety the basal margin of the tergum is very concave between the spur and the basiscutal angle, while the basiscutal angle is sharp, almost tooth-like; and the basal margin of the scutum presents a broad, shallow notch not far from its basi-occludent angle.

The large specimens are about  $1\frac{1}{4}$  in. in greatest diameter of base, and about  $1\frac{1}{2}$  in. high; the small barely  $\frac{1}{2}$  in. across the base, and  $\frac{5}{8}$  in. high.

## 23. *BALANUS ÆNEAS*, sp. nov. (Plate XXXIV. figs. 4-4 b.)

*Loc.* — ?

Shell white, smooth, not very tall, internally longitudinally ribbed; orifice toothed, but not deeply, large and rhomboidal. Radii reduced and very narrow; basis porous, parietes solid. Scutum with the lines of growth distant, not prominent; articular ridge prominent, extending about halfway down the tergal margin; adductor ridge not prominent. Tergum broad, without any beak; spur short, a quarter of the width of the whole basal margin, placed about two-thirds of its own width from the basiscutal angle, its apex rounded.

Mouth: labrum with 2 teeth on each side of the central notch; mandible with 4 large teeth, of which the first is sharper than, and distant from, the others, and 3 small teeth, of which two are situated at the bases of the 3rd and 4th larger teeth respectively, while the third is close to the lower angle; maxillæ with a straight edge and 7 teeth, of which the two upper and the two lower are a little longer than the others.

## XI. Genus CHELONOBIA Leach.

### 24. CHELONOBIA TESTUDINARIA.

*Lepas testudinaria* Linn. Syst. Nat. (1767).

*Chelonobia testudinaria* Darwin, 'Balanidæ,' p. 392, pl. xiv. fig. 1 (1854).

*Loc.* Kota Bharu, Kelantan. Nine specimens.

## XII. Genus PLATYLEPAS Gray.

### 25. PLATYLEPAS OPHIOPHILUS, sp. nov. (Plate XXXV. figs. 5-5 b.)

? *Platylepas* — ? Darwin, 'Balanidæ,' p. 430 (1854).

*Loc.* — ?

*Hab.* Embedded, not very deeply, in the skin of the sea-snake, *Enhydriis curtus*.

Shell depressed, orifice large and ovoid.

Parietes, probably aporous, externally marked with longitudinal ribs which are crossed by transverse grooves, at least in the upper half, giving rise to a beaded appearance; in the lower half the ribs are less obviously broken into beads and project beyond the lower line of the compartment, to the number of three or four on each side of the midrib; they are, however, more pointed than, and not nearly so prominent as, the latter. The midribs of the rostrum and carina are a little shorter than those of the lateral compartments. Internally, the longitudinal ribs are visible in the lower half of the compartment, but in the upper half the shell has thickened considerably, growing inwards nearly to the level of the inner edge of the midrib. Basis only moderately convex. Scuta with the rostral ends narrower than the tergal, rounded, and the outer margins lightly concave; the rostral ends not curved inwards. Terga with the outer margins strongly convex towards the carinal end, these ends being truncate and bent inwards, so as to lie with their margins nearly parallel; scutal ends a little broader than the carinal.

The mouth-parts conform to the characters of the genus and present no specific differences. The rami of the 1st cirri are unequal, but not very much so, the inner exceeding the outer only by its last joint. The penis is long, in one instance twice as long as the whole body from the anterior end of the prosoma to the origin of the penis itself; it gradually tapers to its bluntly truncate apex, the terminal half only with a few scattered,

longish, stiff hairs, the apex with the usual bundle of short bristles.

This species, which Mr. F. F. Laidlaw kindly brought to my notice on an *Enhydris* which he was examining, is possibly identical with one of which Darwin had only a single young and imperfect specimen, taken off Borneo, from the skin of a sea-snake. It agrees in the presence of the "two or three very distinct ridges on each side of the midrib" internally; but I have been unable to satisfy myself, in these small specimens, of the existence of any pores in the parietes, so that an identification with Darwin's form must remain a matter of doubt.

It is clearly marked off from the other two species described by Darwin—(a) from *P. bissexlobata* by the subequality of the rami of the 1st cirrus, and (b) from *P. decorata* by the very moderate convexity of the basis. Moreover, to judge from Darwin's figures, the shell and opercular valves would seem to be considerably thinner in our species.

### XIII. Genus IBLA Leach.

#### 26. IBLA QUADRIVALVIS Cuvier.

*Anatifa quadrivalvis* Cuv. Mém. pour servir . . . Mollusq. figs. 15–16 (1817).

*Ibla quadrivalvis* Darwin, 'Lepadidæ,' p. 203, pl. iv. fig. 9 (1851).

*Loc.* Pulau Bidan, Penang. Numerous specimens.

### XIV. Genus LEPAS Linn.

#### 27. LEPAS ANSERIFERA Linn.

*Lepas anserifera* Linn. Syst. Nat. (1767); Darwin, 'Lepadidæ,' p. 81, pl. i. fig. 4 (1851).

*Loc.* Patani. Two specimens.

### XV. Genus DICHELASPIS Gray.

The following key to the species of this genus is partly based on that given by Hoek in the Report on the Cirripedia collected by the 'Challenger,' and amplified by Stebbing in the 'Annals and Magazine of Natural History,' (6) xv. p. 21 (1895); but I have modified it somewhat in Group B, owing to the relatively larger number, namely eight, of new species which now have to be included in that group.

#### A. Carina terminating in a disk.

Basal segment of scutum narrower than occludent.

Tergum axe-shaped.

Edge crenate

Edge smooth

Basal segment twice as broad as occludent.

Basal segment thrice as broad as occludent.

Tergum narrowing anteriorly

Tergum widening anteriorly

*D. grayii* Darwin.

*D. pellucida* Darwin.

*D. warwickii* Darwin.

*D. antiquæ* Stebbing.

*D. hoeki* Stebbing.

## B. Carina terminating in a fork.

## Terga absent.

Basal segment broader than ocelluent and of the same length .....

*D. cor* Auriv.

Basal segment narrower than ocelluent and shorter.

Basal at right angles to ocelluent .....

*D. aperta* Auriv.

Basal at obtuse angle to ocelluent, then parallel to fork of carina.....

*D. cuneata* Auriv.

Basal segment absent .....

*D. angulata* Auriv.

## Terga present.

Basal segment broader than ocelluent.

Tergum with three teeth .....

*D. alata* Auriv.

Tergum shaped like a horse's head and neck .....

*D. equina*, sp. n.

Basal segment narrower than ocelluent.

Basal half as long as ocelluent, or less.

Tergum triangular .....

*D. aymonini* Lessona.

Tergum with carinal edge rounded, scutal edge with 2 lateral teeth.....

*D. neptuni* Macdonald.

Basal more than half as long as ocelluent.

Tergum with 2 teeth.

Teeth nearly equal .....

*D. sinuata* Auriv.

Teeth very disproportionate .....

*D. trigona* Auriv.

Tergum hook-shaped, handle broad.

Hook large and blunt .....

*D. lowei* Darwin.

Hook small and sharp .....

*D. darwini* Filippi.

## C. Carina terminating in a cup.

## Scutum in two distinct segments.

Basal narrower than ocelluent, tergum with 5 unequal teeth.....

*D. orthogonia* Darwin.

Basal broader than ocelluent, tergum with 3 teeth .....

*D. oclusa*, sp. n.

Scutum with a notch only and indistinctly divided.

*D. sessilis* Hoek.

## D. Carina absent .....

*D. bullata* Auriv.

## 28. DICHELASPIS OCCLUSA, sp. nov. (Plate XXXV. figs. 6-6 c.)

*Loc.* Kelantan; Trengganu.*Hab.* Mouth-parts of *Thenus orientalis*.

The valves in this species are all very closely apposed, much more than in any other species of the genus. The carina extends between the terga by quite  $\frac{1}{3}$  of its own length, is rather strongly curved, and has its anterior end expanded, cup-shaped, and embedded in the peduncle. The scutum consists of two segments, of which the ocelluent is longer than the basal by barely  $\frac{1}{6}$  of its own length, has its tergal margin bluntly rounded, and is united at its rostral end to the basal segment by a narrow bridge of non-calcified tissue; while the basal is  $2\frac{1}{2}$  times the breadth of the ocelluent and separated from it only by a very narrow membranous interspace, and is faintly hollowed on its curved carinal margin close to its tergal angle for the reception of the tip of a strong tooth on the tergum. Between this latter tooth and its ocelluent angle, the tergum is deeply hollowed where it fits round the end of the ocelluent segment of the scutum; the scutal margin thus appears tridentate.

The capitulum is rather flattened from side to side; the peduncle differs in appearance in the adult and young forms, being in the former swollen, a little shorter than the capitulum, and brown in colour; and in the latter not swollen, a little longer



than the capitulum, white and semi-transparent; in both, however, it is thickly studded with minute chitinous papillæ (as in *D. warwickii*).

The 1st cirrus is only  $\frac{2}{3}$  of the length of the 6th, is distant by the thickness of its own pedicel from the 2nd, and has its rami equal; the rami also of the other cirri are equal. The caudal appendage is exactly as long as the pedicel of the 6th cirrus, but appears longer to the naked eye owing to the presence, at its tip, of numerous hairs as long as the joint itself.

As regards the mouth-parts, the outer maxillæ are ovoid, with their inner sides folded over outwardly and their outer surfaces covered with longish hairs; the inner maxillæ each present an incision on their border by which are formed two low step-like projections, the inner being the smaller, and each bears 13 spines, of which the one at the inner angle is much stouter than the rest. The mandibles have 5 teeth, the strongest of which forms the inner angle. The palpi are bluntly conical, with hairs along their outer edges.

The penis is rather thick, and only begins to taper just before its distal end; along its length are several exceedingly short hairs.

This species seems to me to bridge over the narrow gap between the genera *Dichelaspis* and *Pæcilasma*, in relation on the one side with the *Dichelaspids* generally, and on the other side with *Pæcilasma tridens* Auriv. in particular. My grounds for placing it in the former of the two genera are (a) the connection between the two portions of the scutum, and (b) the extension of the carina between the terga; these two points clearly bring it within Darwin's definition of his genus. At the same time, the bridge of tissue connecting the two parts of the scutum is extremely narrow, so that I was, for some time, for considering the two portions as separate valves and for referring the species to the genus *Pæcilasma*; while, on the other hand, the carina in *Pæcilasma tridens* also extends between the terga, though only by  $\frac{1}{3}$  of its length. This species, moreover, has a point in common with those of *Pæcilasma*, and differing from those of *Dichelaspis*, namely, the close apposition of the valves.

But its relationship with both these genera is clearly shown, on the one hand, by the yet present connection between the two parts of the scutum and the extension of the carina between the terga; and, on the other hand, by the almost complete severance of the scutal segments and the close apposition of the valves. And though its possibly closer relationship to one of these genera relieves me of the responsibility of uniting two genera which Darwin separated after the study of a greater number of species, still I feel that there can be little doubt but that the tie between these genera is exceedingly close.

There are also some specimens taken from the extreme base of the chelipedes and from the long epipodite of the 3rd maxillipedes of *Neptunus gladiator*. On the same crab were the specimens of the species next described.



29. DICHELASPIS EQUINA, sp. nov. (Plate XXXV. figs. 7-7 d.)

*Loc.* Trengganu.

*Hab.* Bases of antennules, antennæ and legs, and posterior border of carapace of *Neptunus* (*Amphitrite*) *gladiator*.

The carina in this species is formed of two pieces—a quite short basal portion, and a much longer tergal portion, each of which abuts closely on the other by a small median tooth; these two pieces can be separated readily by caustic potash. In the basal portion the base, embedded in the peduncle, is somewhat widened and forked, but the prongs of the fork are not very prominent; the tergal portion, quite narrow where it abuts on the basal, gradually widens towards its distal end which is squarely rounded.

The scutum consists, as usual, of two parts, connected by a bridge of tissue semicalcified on its occludent side, completely calcified on its basal side (fig. 7 d). The occludent segment is nearly twice as long as the basal (= 5.25 mm. : 3 mm.) and has its apex rounded; the basal segment is twice as broad as the occludent at the middle of its length, three times as broad along its basal margin, and is produced at its rostral angle into a blunt, almost tooth-like process, forming the half-bridge of calcified tissue mentioned above. General shape subtriangular, with rounded angles; its basal and tergo-lateral margins are somewhat convex, the occludent somewhat concave.

The tergum has rather the shape of the head and neck of a horse with forwardly-directed ears (whence the specific name)—the base of the neck lying between the apices of the occludent segment of the scutum of the carina; the top of the head forming the upper, the back of the neck the lower carinal margin; and the snout forming a strong tooth projecting in the direction of the scutum, and the forehead forming the occludent margin.

The 1st cirrus lies close to the 2nd, but yet a little more distant than the rest are from each other; the rami of each of all the cirri are equal; the 1st cirrus is only a little more than half the length of the 6th. The caudal appendage is as long as the 1st joint of the pedicel of the 6th cirrus; it carries hairs at its apex, of which the longest are about half the length of the joint, and also distant bundles of 2-3 longish hairs along the outer margin. The penis is just shorter than the 6th cirrus, thick, but tapering suddenly at the tip, with an excavation at the base, at the distal angle of which excavation is a blunt tooth-like prominence, nearly as high as the excavation is deep; this prominence is set within a shallow hollow within the excavation. The penis also, besides the hairs at its tip, bears along its length scattered hairs, some short and stiff, others long and more flexible; rings very distinct.

The palpi are bluntly conical, with longish hairs at the tip. The mandible has five teeth, the one at the inner angle being the strongest, and the one at the outer angle very small and blunt, lying close to the 4th tooth at its outer base.

The outer maxilla has a deep incision in its edge, at the bottom of which is a spine, externally to it three spines, and internally seven spines; the inner maxilla is ovoid, with long hairs on its outer surface.

The peduncle is equal to, or sometimes a little shorter than, the capitulum in length.

#### VARIATIONS.

This species is very variable in external appearance, one or two of the specimens appearing at first sight to be specifically distinct; but I have no doubt, from a comparison of all the specimens here present, that they are all of one species. These variations are connected with differences in the structure of the membrane, and the form and shape of the valves.

##### (i) *The Membrane.*

The membrane varies, both in the peduncle and capitulum, from the one extreme, in which it is thin, whitish, and translucent, to the other, in which it is thick, brown (in formol), and opaque, with the valves almost invisible; transitional stages connect these two extremes.

##### (ii) *The Valves.*

The tergum is generally shaped like the head and neck of a horse, as described, and formed of a single piece, but varies to the extreme shown in fig. 7 *b*. In two young forms also, with transparent membrane, the head proper is reduced and the neck thickened, giving an appearance as in fig. 7 *c*. In one specimen the base of the neck is formed of a very small separate double piece.

The scutum is generally as described; but the basal segment, generally as high as wide, is sometimes less developed, and is then much wider than it is high. The basal segment is also very variable in the number of pieces of which it is formed, thus:—

Individual specimens: basal segment of scutum:

(a) Very small, calcified separate portions are present—one at the baso-lateral, and two others at the tergal, angles.

(b) Formed of two pieces—a small umbonal, and a large distal (tergal).

(c) Formed of three distinct pieces—(1) a relatively small piece round the umbo of the valve; (2) a large piece, including the basal, and a little more than half of the tergo-lateral, margins; (3) a piece, intermediate in size, including the rest of the tergo-lateral, and the whole of the occludent, margins. The line of the tergo-lateral margin is markedly irregular.

(d) On the right side (in relation to the animal) of three pieces as in *c*; on the left side of two pieces, a large umbonal and somewhat smaller distal (tergal), the suture between them running irregularly from the middle of the tergo-lateral, to the middle of the occludent, margins. The carina is constantly formed of two

pieces, of which the distal (tergal) broadens to the blunt distal end.

*Affinities*.—This species is certainly closely allied to *Dichelaspis warwickii* Gray. The general external appearance is much the same, making allowance for its variability in this species, and the mouth-parts appear to agree essentially with the description of *D. warwickii* given by Darwin (Lep. pp. 121–122). But it differs in the fact that the valves are not thin and translucent, but thick and opaque; in the distal broadening, and division into two parts, of the carina; in the shape of the tergum (despite its variability); and in the fact that the 1st cirrus is not "far removed from the 2nd," and that the rami of the 2nd are not unequal.

Although the shape and fission of the carina is the most constant external feature, I have found it difficult to fix that fact satisfactorily in the specific name; words such as *bicarinata*, *fissicarinata*, or others suggesting rather a reduplication of the carina than a single carina formed of two pieces.

I have, therefore, fixed on the horse-like shape of the tergum, which, though not constant, still evidently represents the typical form of that valve in the species, by which to designate the species; hence the specific name *equina*.

### C. ISOPODA.

#### XVI. Genus CYMOTHOA Fabr.

##### 30. CYMOTHOA STROMATEI Bleeker.

*Cymothoa stromatei* Blkr. Act. Soc. Sci. Indo-Néerland. ii. p. 35, pl. ii. fig. 13 (1857).

*Loc.* —? *Hab.* "Mouth-parts of fish, chiefly of Ikan dalam." Six females and a small male.

##### 31. CYMOTHOA PULCHRUM, sp. nov. (Plate XXXV. figs. 8–8 a.)

*Loc.* Pulau Bidan. One female.

Eyes invisible, lateral prolongations of the 1st thoracic segment reaching very nearly to the level of the front, which is rounded acuminate. Cephalic segment  $\frac{3}{4}$  as long as broad (4.5: 6 mm.), superiorly depressed so as to form a shallow pit; 1st thoracic segment the longest, 2nd, 3rd, and 4th a little shorter and subequal, 5th, 6th, and 7th gradually becoming shorter, the 5th not abruptly shorter than the 4th; segments 1–6 rugose, the rugosities becoming gradually less marked on the hinder segments, the 7th smooth; the lateral prolongations of the 1st segment smooth, curved forwards and inwards, bluntly pointed in front. Abdomen abruptly narrower than thorax, the segments gradually increasing in width to the 5th, which is as wide as the last thoracic, and the 6th, which is as wide as the penultimate thoracic, segments. 6th abdominal segment about twice as wide as long (15: 7 mm.), somewhat excavate in the anterior median line, and slightly

swollen and coarsely reticulate laterally; uropods just shorter than the 6th segment; rami equal, inwardly curved, and narrow, the outer being a little broader than the inner. Distal end of the crest on the last four thoracic legs increasing gradually in height from before backwards; unguis of all the legs curved, moderately long, and increasing in size backwards but only very gradually, so that those of the last pair are only a little longer than those of the first pair.

Length 35 mm.; breadth 17 mm.

#### XVII. Genus MEINERTIA Stebbing.

##### 32. MEINERTIA CARINATA Schiödte & Meinert.

*Ceratothoa carinata* Sch. & Mein. Naturhist. Tidsskr. iii. 13, p. 327 (1883).

*Loc.* Great Redangs. Several specimens.

#### XVIII. Genus NEROCILA.

##### 33. NEROCILA SUNDAICA Bleeker.

*Nerocila sundai* Blkr. Crust. Ind. Arch. i. p. 26, fig. 4; Sch. & Mein. Naturhist. Tidsskr. iii. 13, p. 9 (1881).

*Loc.* — ? A single female.

Although the anal segment and uropods are much damaged, there is no doubt in my mind that this specimen belongs to the above species, presenting as it does three very characteristic features: namely, the swollen basal joints of the first antennæ, the pectination of the 3rd and 6th–7th legs, and the constriction of the unguis of the other legs. In two points, however, it differs; for the median concavity in the anterior margin of the first segment is slightly deeper (not shallower) than the lateral, and the first four abdominal segments are all subequal, the fifth being only very slightly longer.

#### XIX. Genus ROCINELA Leach.

##### 34. ROCINELA MUNDANA, sp. nov. (Plate XXXV. figs. 9–9 a.)

Tale Sab. "From the gills of a freshwater skate."

Flagellum of 1st antennæ 4-articulate, of 2nd antennæ 12-articulate; eyes distant, reniform, with the anterior end truncate; ocelli fairly large, numerous.

Front bluntly triangular, projecting in front of the eyes, and only just concealing the base of the 1st antenna; 1st thoracic segment longer than the rest, which are subequal, its anterior border trisinate; epimera small, increasing in size backwards, the last just overlapping, with its blunt point, the posterior angle of the last segment; 1st abdominal segment partly concealed, distinctly shorter than the rest; its posterior border sinuate, those of the rest becoming straighter towards the telson.

Telson with a transverse swelling at the base on each side of



the middle line; these swellings just meet at the middle line, and from their junction proceeds a very short longitudinal median swelling; the rest of the upper surface smooth and slightly convex. Tip of telson extremely blunt. Uropods with ciliate margin; outer rami as long as telson, inner just longer, and twice as broad as the outer.

Anterior legs without teeth, but with a few short cilia; posterior legs with a few short spines along the lower border of the 3rd to the 6th joints; ungues short.

## XX. Genus SPHEROMA Latr.

### 35. SPHEROMA FELIX, sp. nov. (Plate XXXV. fig. 10.)

*Loc.* —? Thirteen specimens.

Body gradually widening from the head to the abdomen, the telsonic portion of which narrows suddenly at the level of the base of the uropods, and thence rather more gradually to the posterior end. Eyes conspicuous, but small. The posterior portion of each of the thoracic segments is marked off from the anterior portion as a raised, broadish, transversely-grooved ridge; the anterior portion, which is smooth, slides, in extension, under the raised portion, which is finely, but rather widely, granulate, as is also the cephalic segment. On the abdomen, and the upper surface of the inner rami of the uropods, the granules are larger, placed more thickly, and concealed under a rather dense, but very short, pubescence. The telson, from the base of the uropods, is bluntly triangular, with its margin non-granulate and reflexed upwards; the inner ramus of the uropods is a little longer than the telson, the outer a little longer than the inner, with its upper surface smooth, and its outer edge fringed with short hairs and bearing 8 small teeth.

## *A List of the Terrestrial Isopods.*

By M. GUSTAV BUDDE-LUND.

1. *Ligia exotica* Roux.—Several specimens; Kamlon, Singapore.

2. *Trichoniscus antennatus*, n. sp.—A few specimens of this little species (circa 5 mm. long), without information as to the locality. Distinguished by the very long and slender antennæ, which have a long flagellum, 15-articulate; the antennæ also, especially the first joint, are proportionally long. The uropods have the basal joint, and the exopodite, long and thick, the endopodite very thin.

3. *Philoscia truncatella*, n. sp.—Two specimens, both with damaged antennæ and uropods, from Gunong Inas, Perak, 5000 ft. Seems to be allied to *P. truncata* Dollf., from Celebes and Flores, but the last segment of the truncus is obliquely truncate only on the inside of the epimere; also the transverse line on the epistome is a little sinuate, forwardly, in the middle. Another small,



damaged, specimen, from rotten wood at Ajenz (? Aring, W. F. L.), Kelantan, perhaps also belongs here.

4. *Philoscia incurva*, n. sp.—Only one specimen, without the uropods and with damaged antennæ, from Patalung. Differs from the other Asiatic species in the proportionally well-developed epimera of the caudal segments, which are acute and produced outwardly and backwardly; the last segment of the truncus has the hind margin very deeply incurvated.

5. *Alloniscus brevis* B.-L.—Many specimens from Patalung; a single specimen from Pulau Bidan, Penang.

6. *Alloniscus* sp.—Only one specimen of a little Oniscoid Isopod taken at Bukit Besar. It is without the uropods, and seems to be akin to the *Alloniscus albus* Dollf. from Sumatra.

7. *Metoponorthus pruinus* Brandt.—Eight specimens among specimens of *Armadillo murinus* Br. from Patani.

8. *Lyprobius* sp.—Only one specimen from Patani. This species is perhaps not different from *L. cristatus*, a species which is found in most tropical parts. I think also that *Porcellio sundanicus* Dollf., from Sumatra, Java, and Celebes, belongs here; and that *P. pallidipennis* Dollf. from Flores, and *P. modestus* Dollf. from Saleyer, should certainly also be included in this subgenus.

9. *Toradjia conglobator*, n. sp.—Three specimens from rotten wood at Ajenz (? Aring, W. F. L.), Kelantan. I know several species of this genus, in which M. Dollfus has included three species—*T. celebensis* Df., *T. gorgona* Df., and *T. cephalica* Df. The *Perysciphus weberi* Df. may be placed here, and *T. conglobator* is most nearly allied to this latter species, the first segment of the truncus not being split in the posterior edges, and the epistome being plain. The antennæ are shorter than in *T. weberi*, with the flagellum short, white, and basal joint very short.

10. *Armadillo murinus* Brandt.—Several specimens from Patani.

11. *Armadillo infuscatus*, n. sp.—Several specimens from Goah Janat. This species and the next belong to the group of which *A. murinus* is the type, having the epimera of the truncus without folds in the hind margin of the first segment. This species is rather larger than *A. murinus*, and has the endopodite of the uropods much longer than in that species. The colour is a dirty pale yellow.

12. *Armadillo pallidus*, n. sp.—Six specimens from Bukit Besar. Very like *A. infuscatus*, but well separated by the form of the telson, which is not so strongly narrowed in the middle, and has the apex much longer than the basis; the basal joint also of the uropods is narrower.

13. *Spherillo griseus*, n. sp.—Several specimens from Aring, Kelantan. This little species (5 mm. long) is remote from all

hitherto described species, but allied to several new species I have seen. It has some affinity with *S. ambitiosus* B.-L., but has a little fold in the hind edge of the first segment of the truncus: the apex of the telson is quadrangular, not narrowed in the middle, and the exopodite of the uropods scarcely visible.

[I have slightly modified, or occasionally condensed, the language of these descriptions kindly supplied me by M. Budde-Lund.—W. F. L.]

#### EXPLANATION OF THE PLATES.

##### PLATE XXXIV.

- Fig. 1. *Diogenes desipiens* (p. 366). Antennal region. 1 *a*. Left chela.  
 2. *Diogenes mixtus* (p. 367). Antennal region. 2 *a*. Chela. 2 *b*. 3rd left leg.  
 3. *Balanus amaryllis dissimilis* (p. 369). 3-3 *a*. Scutum. 3 *b-c*. Tergum.  
 4. *Balanus ceneas* (p. 370). From above. 4 *a*. Scutum. 4 *b*. Tergum.

##### PLATE XXXV.

- Fig. 5. *Platylepas ophiophilus* (p. 371). From above. 5 *a*. From below. 5 *b*. A lateral compartment, seen from the inside.  
 6. *Dichelaspis oclusa* (p. 373). From the side. 6 *a*. Tergum. 6 *b*. Carina. 6 *c*. Scutum.  
 7. *Dichelaspis equina* (p. 375). Carina. 7 *a*. Tergum, typical form. 7 *b-c*. Two different forms of the tergum. 7 *d*. Scutum.  
 8. *Cymothoa pulchrum* (p. 377). From above. 8 *a*. From the side.  
 9. *Rocinela mundana* (p. 378). From above. 9 *a*. Posterior leg.  
 10. *Sphæroma felix* (p. 379). From above.

#### 4. On a Collection of Dragonflies made by the Members of the "Skeat Expedition" in the Malay Peninsula in 1899-1900. By F. F. LAIDLAW, B.A.

[Received November 18, 1902.]

#### PART II.<sup>1</sup>

##### CŒNAGRIONINÆ.

In dealing with the last of the subfamilies represented in this collection, I have attempted as before to give a complete list of species hitherto recorded from the Peninsula. This list will shortly prove to be incomplete, for I have in my hands awaiting examination a fine collection of Odonata, made by Mr. Annandale, who has revisited the Peninsula; and, from a casual inspection of his specimens, it is evident that it includes a number of species which are, if not new to science, at any rate new to the Peninsula. Further, I am informed by Dr. Foerster, to whom I am much indebted for kind assistance and courtesy, that he has recently received a large consignment of Odonata from the same locality, including new and remarkable forms.

I venture to hope, however, that the present list may none the less be of some service.

I take the opportunity of correcting two or three errors, of which I find I have been guilty in the first part of this account.

<sup>1</sup> Part I., see P. Z. S. 1902, i. p. 63.

Firstly, in dealing with the sexual characters of *Tetrathemis*, I was not acquainted with a paper of Dr. Foerster's published in the 'Természetrájkí Füzetek' (1900, pp. 81-108), where, in describing two new species of this genus from New Guinea, he calls attention to the peculiar differences between the armature of the femurs of the two sexes. Secondly, he has pointed out in a letter that the forms which I identified as *Gynacantha rosenbergi* Brauer probably do not belong to that species, which does not occur west of Banda. My specimens are perhaps referable to *G. basiguttata*, but I have not had the opportunity of re-examining them.

Lastly, in my description of *Gomphus consobrinus*<sup>1</sup> (P. Z. S. 1902, vol. i. p. 80), "Type A of Selys" should read "Type B of Selys," whilst *Echo tricolor* Krüger, on page 85, should be altered to *E. iricolor* Krüger.

(Species marked with an asterisk are not included in our collection.)

#### Legion LESTES.

LESTES RIDLEYI Laidlaw.

*Lestes ridleyi* Laidlaw, P. Z. S. 1902, p. 92.

One male from Gunong Inas.

LESTES PRÆMORSA.

*Lestes præmorsa* Kirby, Cat. Odonata, p. 162; Krüger, Stett. ent. Zeit. 1898, p. 130.

A number of specimens from Kwala Aring.

Concerning this species, I find the following notes in my diary:—Aug. 20th (1899): "I found to-day large numbers of a species of Dragonfly over a pond; I caught several pairs."

Aug. 28th (1899): "I noticed that the species which I had seen so abundantly near the pond had disappeared almost entirely. I have only found it in this one spot."

#### Legion PODAGRION.

\*PODOLESTES ORIENTALIS Selys.

*Podolestes orientalis* Kirby, Cat. Odonata, p. 126; Krüger, Stett. ent. Zeit. 1899, p. 98.

Recorded from Malacca.

\*AMPHILESTES MACROCEPHALA Selys.

Malacca.

AMPHILESTES MIMA Karsch.

*Amphilestes mima* Karsch, Ent. Nachr. xvii. (1891) p. 242; Krüger, Stett. ent. Zeit. 1898, p. 100.

<sup>1</sup> Mr. Calvert has pointed out to me, since this paper was read, that this name is pre-occupied by *Gomphus consobrinus* Walsh = *G. externa* Selys (see Kirby, Cat. Odonata, p. 66). Accordingly, I propose to alter the name to *G. kelantanensis*.

A very beautiful and striking species. I believe that the female has not as yet been described; it differs markedly from the male and is fully as brightly coloured. I append a short description of it:—

♀. Head, prothorax, and thorax nearly as in the male, the yellow rather less vivid, and the black stripes on the upper lip and epistome continuous with the black markings near the base of the antennæ.

The abdomen is chestnut-brown above, but the first segment is yellowish green. Segments 2-6 each with a black apical ring feebly developed on the second segment. Immediately before the apical ring there is on each of these segments a dorsal yellowish-green mark, extending forward in 2-3 for about one-half, and in 4-6 for about one-third, of the total length of the segment. This mark is divided longitudinally in each segment by a thin brown line on the mid-dorsal carina.

In segments 3-6 the black apical ring sends forward on either side of the segment a black line, extending nearly the whole length of the segment.

In the seventh segment the anterior half is black, and the yellowish-green marking here is divided into two parts, well separated from each other and diverging posteriorly, the space between them being occupied by a triangular extension forward from the apical ring, which also sends forward, as in the preceding segments, a lateral mark on either side. Segment 8 is black dorsally, with a yellowish-green band either side, and beyond these again black lateral lines. Segments 9-10 are black, 9 with a small and 10 with a minute pair of yellowish spots. Under surfaces yellowish brown. Appendages short, yellow, with black tips.

Length of abdomen 30 mm., of hind wing 24 mm.

Several pairs from a stream near Kwala Aring.

#### Legion PROTONEURA.

##### PROTOSTICTA FOERSTERI, sp. n.

One female from Gunong Inas, Perak.

Lower lip rounded, with short lobes. A small supplementary basal postcostal nerve present, lying at a level between the base of the wings and the first antenodal costal nerve. Pterostigma trapezoid, dark brown in colour, surmounting a single cell, its anterior margin shorter than its posterior; followed by a single row of cells. Sectors of the arculus united from their commencement for a short distance. Upper sector of the quadrilateral ending against the hind margin of the fore wing at the level of the first postnodal costal nerve; that of the hind wing one cell lower. *No trace of the lower sector of the quadrilateral.* The median sector starts from the nodal vein, the subnodal a little beyond it.

Head black; upper lip and rhinarium bluish white, the former with a black margin; antennæ yellowish.



Prothorax dull yellow, a pair of black spots on either side of the mid-dorsal line on the median and posterior lobes.

Thorax bronze-black above, sides dull brownish yellow, with an indistinct black line along the second lateral suture.

Abdomen black, segments 3-7 with a pale yellow basal ring.

Hinder dorsal half of segment 9 yellow. Segments 2-6 with an indistinct wide yellowish-brown ring lying behind the middle of each segment, save in segment 2 where it occupies the greater part of the segment.

Appendages black.

Legs yellow with long yellow spines, 6-7 pairs of these on the third pair of tibiae, directed almost laterally.

Length of hind wing 17.5 mm., of abdomen 30 mm.

This species is the smallest member of its genus. It is of interest geographically, as the other species are recorded from the Celebes and Philippines. It is also of interest because, having its median and subnodal sectors arranged as in those species, it tends to prove that the genus is a natural one and not derived polyphyletically from *Platysticta*.

\**PLATYSTICTA QUADRATA* Selys.

Singapore.

\**DISPARONEURA ANALIS* Selys.

Sumatra. Malacca.

\**D. INTERRUPTA* Selys.

Sumatra. Banca. Singapore.

*D. HUMERALIS* Selys.

*Disparoneura humeralis* Kirby, Cat. Odonata, p. 134.

2 ♂, 1 ♀ from Kwala Aring.

In one of the males there is no trace of the lower sector of the quadrilateral on the hinder wings.

♀. Pterostigmata nearly black, paler round the edges. Upper lip and genæ yellowish brown; a stripe of the same colour runs across the vertex. The prothorax has a pair of lateral yellow marks continuous with antehumeral lines of the same colour on the thorax.

Abdomen with the mid-dorsal crest of segments 2-3 yellow. 3-6 with a pair of small lateral yellowish-white spots at their bases. All these markings are on a black ground.

*DISPARONEURA COLLARIS* Selys.

A single male from Kwala Aring.

*CACONEURA GRACILLIMA* (Selys) ?

A single male from Kwala Aring, very immature, shrivelled, and without segments 7-10 of the abdomen.



No supplementary basal postcostal nerve. Lower lip with short, rounded lobes. Lower sector of quadrilateral entirely absent.

Very slender body. Basal postcostal nerve lying between the level of the two costal antenodal nerves. Upper sector of the quadrilateral of the fore wings not reaching to the first transverse nerve after the quadrilateral; in the hind wing it extends one cell further. 14 postcostal nerves on the fore wing.

Certainly closely allied to *C. gracillima* as described by de Selys, but with the following points of difference:—Upper lip entirely black. Segments 2, 3 of abdomen without a pale dorsal stripe.

*C. gracillima* is said by Selys to come probably from the Celebes or possibly from Borneo. Krüger (Stett. ent. Zeit. 1898) remarks that the species known hitherto belonging to the "*gracillima*" section of the genus all came from Borneo. He describes a new species belonging to this section from Sumatra. The present specimen is in all probability a representative form of *C. gracillima*, and when better known will most likely require naming as a distinct species.

#### Legion PLATYCENEMIS.

\*TRICHOCNEMIS MEMBRANIPES (Rambur).

Singapore. Malacca.

\*TRICHOCNEMIS OCTOGESIMA Selys.

Singapore.

TRICHOCNEMIS BORNEENSIS Selys.

*Celiccia borneensis* Kirby, Cat. Odonata, p. 128.

1 ♂, 4 ♀ from Kwala Aring belong, I believe, to this species. Mr. Annandale's collection includes a fine series of insects belonging to this genus; accordingly I prefer to leave these specimens without comment for the present.

\*COPERA VITTATA (Selys).

Malacca.

COPERA MARGINIPES (Ramb.).

*Copera marginipes* Kirby, Cat. Odonata, p. 129.

*Psilocnemis marginipes* Krüger, Stett. ent. Zeit. 1898, p. 101.

Four males and a female from Kwala Aring, Sept. 1899.

These agree closely with Selys's description, but the males have the epistome and genæ largely yellow. The posterior pair of tibiae of the males are strongly dilated, and the upper anal appendages are only one-fourth the length of the lower pair.

## COPERA ATOMARIA (Selys).

*Copera atomaria* Kirby, Cat. Odonata, p. 129.

Three females and a male, all immature, from Kwala Aring, in September.

The upper anal appendages of the male are fully one-half the length of the lower pair. The second pair of tibiae are not dilated, the third pair are unfortunately lost.

Legion CŒNAGRION. (*Agrion* of Selys.)

## PERICNEMIS STICTICA Selys.

*Pericnemis stictica* Kirby, Cat. Odonata, p. 158; Krüger, Stett. ent. Zeit. 1898, p. 125.

One male from the foot of Gunong Inas.

Length of abdomen (without appendages)...	55	mm.
„ hind wing .....	32.5	„
„ appendages (upper pair).....	1	„

This species is one of the largest and in some respects the most remarkable member of the “legion.” It has previously been recorded from Java and Sumatra, but apparently the appendages of the male have not hitherto been described. These, it will be seen, bear a closer resemblance to those of species belonging to the genus *Amphicnemis* than to those of species of *Teinobasis*.

The most striking peculiarity of the species, apart from its large size and extremely slender proportions, is the pentagonal shape of the pterostigma, most marked in the fore wing. The pterostigma is brownish black with a lighter margin, the whole surrounded by a thick black nerve.

Another remarkable feature is the curious “horn” curving upwards and a little forward from the middle of the hinder margin of the prothorax.

The upper pair of appendages of the male are rather slender; they curve inwards and a little downwards. They are black at the base, but for the greater part of their length dull yellow. Each bears rather beyond its middle a small tooth on its upper inner surface.

The lower pairs are shorter and much slenderer; they run nearly straight back, converging slightly. Each at its extremity meets the extremity of the upper appendage of its own side. Coloration similar to that of the upper pair. Both pairs are black at the tip.

## TEINOBASIS KIRBYI, sp. n.

A single male, unfortunately much damaged, from Gunong Inas. As it is quite distinct from any described species, it is well, I think, to describe it in spite of its mutilated condition.

Length of hind wings 25 mm.

Wings petiolated to the level of the commencement of the quadrilateral. Claws smooth, without teeth. Inner margin of

the pterostigma more oblique than the outer. Pterostigma black, with pale margin, enclosed by a very thick black nerve. Median and subnodal sectors united by a common stalk from their origin as far as the first transverse nerve they encounter (on the right fore wing beyond it for a short distance). Posterior tibiae with four pairs of black spines.

Upper surface of the head dark green, upper lip dull bronze, nasus black, antennæ brown, postocular surface dirty white. Prothorax dull brown, dorsal surface of thorax bronze-green, sides and under surface greyish white, pruinose.

Abdomen (segments 1-7 only) bronze-black above, dull dark brown below.

Allied to *T. superba* from the Celebes and Moluccas. It differs in details of coloration and in having only four spines on the posterior tibiae.

\*TEINOBASIS RUFICOLLIS (Selys).

\*ARCHIBASIS MELANOCYANA (Selys).

ARGIOCNEMIS RUBEOLA Selys.

*Argiocnemis rubeola* Kirby, Cat. Odonata, p. 153.

Race *sumatrana*? Krüger, Stett. ent. Zeit. 1898, p. 126.

1 ♂ from Khota Baru, Kelantan.

ARGIOCNEMIS NIGRICANS Selys?

*Argiocnemis nigricans* Kirby, Cat. Odonata, p. 158; Krüger, Stett. ent. Zeit. 1898, p. 126.

4 ♂, 1 ♀ from Khota Baru, Kelantan.

Like Krüger's specimen, mine are rather larger than Selys's.

Length of hind wing, ♂ 15, ♀ 16 mm.

    "    abdomen, ♂ 27, ♀ 26   "

Postnodal nerves from 9 to 18 on the fore wing. The middle lobe of the prothorax rather truncate, not rounded.

The males differ from Selys's description in having segments 8-9 of the abdomen of a dull-brown colour (probably blue in the living insect), whereas in the male described by Selys there is a trilobed blue mark on the eighth segment. Otherwise the agreement is fairly close. It should be remarked, however, that the colour-pattern of my four male specimens shows no variation. The female is exactly like that described by Selys as the female of *A. nigricans*. I am disposed to think that the female described by Selys as belonging to *nigricans* did not belong to the same species as the male. His measurements suggest this. They are:—

Length of abdomen, ♂ 22, ♀ 25-28 mm.

    "    hind wing, ♂ 15, ♀ 17-19   "

If I am right, then, in taking this view, it follows that the female of the true *A. nigricans* is as yet unknown, whilst my specimens belong to a distinct species, differing from *A. nigricans*,

so far as the male is concerned, in being somewhat larger, in having segments 8-9 of the abdomen blue or brownish blue, and in addition having a black epistome, and no black carina on segment 1.

It is, however, scarcely advisable to name this supposed new species until definite evidence as to the female of the typical *A. nigricans* is forthcoming.

See also Selys, Ann. Mus. Gen. (2) x. 1890, and Ris, Arch. f. Naturg., Jahr. 66, Bd. i. p. 200.

\**AGRIOCNEMIS MINIMA* Selys.

*Agriocnemis minima* Kirby, Cat. Odonata, p. 151; Krüger, Stett. ent. Zeit. 1898, p. 126.

Collected by Dohrn in Penang.

*AGRIOCNEMIS INCISA* Hagen.

*Agriocnemis feminina* Kirby, Cat. Odonata, p. 158.

*Agriocnemis incisa* Krüger, Stett. ent. Zeit. 1898, p. 127; Ris, Arch. f. Naturg., Jahr. 66, Bd. i. p. 200, pl. x. fig. 19 (1900).

Two males and a female of the orange variety from Khota Baru, Kelantan.

The rose-colour of the latter only extends to the fifth abdominal segment.

*AGRIOCNEMIS PULVERULANS* Selys.

*Agriocnemis pulverulans* Kirby, Cat. Odonata, p. 158; Krüger, Stett. ent. Zeit. 1898, p. 127.

4 ♂ from Khota Baru, Kelantan.

The members of the above genus are the smallest known Odonates. The length of the hind wing of a male of *A. incisa* is 9 mm. and of the abdomen 16 mm. Both this and the preceding genus (*Argiocnemis*), as well as the two following, are found, so far as my experience goes, chiefly in cultivated low-lying land near the coast. Certainly I never saw specimens of any of them "up-country," whilst in the big rice-fields about Kelantan and Tringganu they are the only Ctenagrions that are at all abundant.

\**ONYCHARGIA ATROCYANA* Selys.

Singapore.

\**ONYCHARGIA VITTIGERA* Selys.

Singapore.

*PSEUDAGRION MICROCEPHALUM* Ramb.

*Pseudagrion microcephalum* Kirby, Cat. Odonata, p. 153.

3 ♂ from Tringganu.

*CERIAGRION CERINORUBELLUM* (Brauer).

Penang. Sumatra. Ceylon.

*CERIAGRION ERUBESCENS* Selys.

*Ceriagrion erubescens* Krüger, Stett. ent. Zeit. 1898, p. 127.

*Ceriagrion coromandelianum*, race *erubescens* Selys, Ann. Mus. Gen. (2) x. 1890.

3 ♂, 1 ♀ from Khota Baru, Kelantan. Recorded from Sumatra and Burmah.

5. On a new Species of Marine Spider of the Genus *Desis* from Zanzibar. By R. I. Pocock, F.Z.S.

[Received November 18, 1902.]

(Text-figure 78.)

In a monograph of the marine Spiders of the genus *Desis*, published in the Society's 'Proceedings' for 1902, vol. ii. pp. 98-106, I drew attention to the fact that, so far as was then known, these Spiders existed only upon the coasts of Cape Colony and of the countries of Austro-Malaya, and commented upon the absence of any record of their occurrence along the miles of coast-line that intervene between Durban and Singapore.

While this paper was in the press I received from Mr. Cyril Crossland the news that he had discovered a Spider beneath stones between tide-marks while hunting for other marine objects at Zanzibar. It was with great satisfaction that I undertook to determine the Spiders from this new and interesting locality, naturally expecting them to show close affinity to the two known forms from Cape Colony. Much to my astonishment, they proved to be nearly related to the species of the Austro-Malayan type, not even tending in any respect to bridge over the structural interval that separates the S. African from the Malaysian species.

In the paper already referred to, I pointed out that the intermediate form between the two groups of species, namely, the *Paradesis*-group from Cape Colony and the *Desis*-group, in the strict sense of the word, from Austro-Malaya, is represented in Australia by *Desis kenyonae*; and this fact I suggested furnished evidence in favour of the view that S. Africa had received its representatives of marine Spiders from Australia by means of a trans-oceanic land-connection to the south of the Indian Ocean. This conclusion is in no sense invalidated by Mr. Crossland's discovery of the genus at Zanzibar, because, as already stated, the Zanzibar form stands no nearer to the South-African forms in specific structural features than do those inhabiting the Malaysian seas. The discovery shows conclusively, however, that the North-eastern coast of Africa has received its representatives of *Desis* from the same source whence the Austro-Malayan forms emanated, and renders almost certain the existence of the genus in suitable localities along the shores of Southern Asia westwards of Singapore.

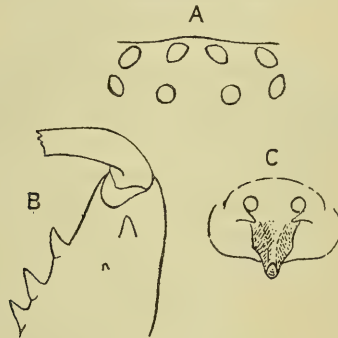


These considerations point to the conclusion that the African species of *Desis* made their way into the country by two routes, one lying to the north, the other to the south of the Indian Ocean.

*DESIS CROSSLANDI*, sp. n. (Text-fig. 78.)

♀. Colouring like that of the other species of the genus, the mandibles and cephalic region of the carapace deep castaneous; sternum and mouth-parts a little or considerably paler; legs pale ochre, with scopular hairs on tarsi and protarsi fuscous; abdomen testaceous.

Text-fig. 78.



*Desis crosslandi*.

A. Eyes from above. B. Distal extremity of right mandible from below. C. Vulva.

*Carapace* about as long as tarsus + protarsus, rather longer than patella + tibia of 4th leg; a little shorter than patella + tibia of 1st and as long as protarsus +  $\frac{1}{2}$  the tarsus of this appendage. *Eyes* (text-fig. 78, A) of the posterior line slightly procurved, subequally spaced, the medians only a little farther apart than either is from the lateral, the medians about 2 diameters apart and perhaps  $1\frac{1}{2}$  diameters from the laterals; anterior median eyes about a diameter apart and about two diameters from the anterior laterals (in other specimens the eyes appear to be larger and the distances between them consequently less).

*Mandibles* (text-fig. 78, B): of the two teeth on the postaxial (posterior or outer) border of the fang-groove the distal is much the larger, the space between the two being equal to about three or four times the length of the proximal, and only a little less than the space between the distal and the base of the fang; teeth of the preaxial or inner side of the fang-groove normally seven in number, the first, situated opposite the interval between the two teeth of the outer (postaxial) row, smaller than the second, third, or fourth, which are large and progressively but only slightly

decrease in size towards the proximal end of the mandible; all the teeth evenly spaced.

*Legs* 1, 4, 2, 3 in length. 1st leg with a superior basal spine on femur, the remaining segments unspined: 2nd leg with superior basal and anterior apical femoral spine, three inferior apical protarsal spines (sometimes one median inferior protarsal spine as well), and one inferior median tarsal spine: 3rd leg with one superior basal and three apical spines on femur, one superior, two or one anterior and two or one posterior, and two inferior apical spines on tibia; one superior, two anterior, two posterior, and five inferior, of which three are apical, on the protarsus, and six inferior spines on the tarsus: 4th leg with one superior basal and one posterior apical spine on femur, two or three posterior, three inferior spines, of which two are apical, on the tibia, and about twelve spines on the protarsus somewhat irregularly arranged as follows—two above, two behind, two in front, and three pairs beneath; the tarsus armed with about six spines: the protarsi of the 2nd, 3rd, and 4th legs furnished beneath with a pad of greyish hairs.

*Vulva* (text-fig. 78, C) formed upon the same plan as in the other species of the genus, the median excavation very shallow, the lateral teeth distinct and projecting inwards and downwards, the posterior median angle forming a rounded, smooth, sub-vertical prominence showing a shallow basal constriction.

Measurements in mm.:—Total length 10, carapace 5; 1st leg 15, 2nd leg 11, 3rd leg 13, 4th leg 9.5.

*Loc.* Zanzibar. "Under stones at low tide" (*Cyril Crossland*).

In a young specimen (about 2 mm. in length) the eyes have the same arrangement as in the adults, but are relatively much larger and consequently closer together; the mandibles are less prominent, and armed below with one outer and four inner teeth; the trochanter of the palp is small, not elongate; the maxillary processes are parallel-sided, lightly convergent, and obtusely rounded at the apex; and the labium is wider than long and almost semicircularly rounded marginally.

In the spacing of its eyes and the spine-armature of its legs this species is allied to *D. maxillosa*, *vorax*, *martensi*, and *marina*, which constitute a group hitherto believed to be restricted in range to the coasts lying between Singapore and New Zealand. Of these four species, the only two known to me are *D. martensi* from Singapore and *D. marina* from New Zealand and Australia. From both of these *D. crosslandi* differs in the form of the vulva and the closer spacing of the eyes. It resembles *D. marina* in the size and spacing of the two teeth on the posterior or outer side of the fang-groove of the mandible; but in *D. marina* the first tooth of the inner row is separated by a relatively wider space from the second than is the case in *D. crosslandi*.

Of the other two species, namely, *D. vorax* from Upolu and *D. maxillosa* from New Guinea, &c., I can only speak with

hesitation, knowing them merely from the published figures and description. *D. crosslandi* apparently differs from both in the dentition of the mandible, the two outer teeth of the fang-groove being apparently equal and widely spaced in *D. vorax*, and close together and unequal in *D. maxillosa*, whereas in *D. crosslandi* they are unequal as in *D. maxillosa* and widely spaced as in *D. vorax*. No doubt other differences will be discovered when examples of the three species are compared side by side.

6. On some new Harvest-Spiders of the Order Opiliones from the Southern Continents. By R. I. Pockock, F.Z.S.

(Text-figures 79-84.)

[Received November 18, 1902.]

The species described in the following pages are based upon specimens in the British Museum. Perhaps the most interesting part of the paper is the section devoted to the Insidiatores, where considerable additions to our knowledge of this group are to be found. The genera known up to the present time are confined to the southern continents—*Diasia* occurring in Chili, *Tricenonyx* in Chili and the Fiji Islands, *Nuncia* being from Stephen's Island, New Zealand, *Trienobunus* from Eastern Australia, *Acumontia* from Madagascar, *Larifuga* from Cape Colony, and *Adæum* from Cape Colony and Stephen's Isl., New Zealand. To these I have added *Lomanella* from Tasmania and *Sörensenella* from New Zealand. It is also my good fortune to be able to point out the extension of the genus *Trienobunus* to Tasmania, and of *Tricenonyx* to New Zealand and Australia, and to be able to add eight new species to the twelve already described.

It seems superfluous to point out the evidence, supplied by the geographical data quoted above, for the former existence of a land-connection between South Africa and Austro-Zelandia on the one hand, and South America and Austro-Zelandia on the other. The former is attested by the existence of the genus *Adæum* both in South Africa and New Zealand; the latter by that of *Tricenonyx* in Chili and Austro-Zelandia. Up to the present time, however, this group of Opiliones supplies no proof of a direct connection between South America and South Africa by means of an antarctic transatlantic extension of land.

Suborder PLAGIOSTETHI.

Fam. PHALANGIIDÆ.

Genus PHALANGIUM Linn.

PHALANGIUM LEPPANÆ, sp. n.

Colour variable: greyish brown, often marbled with darker

patches forming a series of spots suggesting the median dorsal band of *P. opilio*; palpi pale, with darker brown stripes on the femur and patella; legs indistinctly annulated, with femora dark brown, the spines white; patella dark below, tibia with an indistinct broad dark band.

♂. *Dorsal integument* closely granular: carapace with a cluster composed of nearly twenty long and strong or shorter and weaker spines in front of the ocular tubercle; some marginal spines as well; one spine on each side near the tubercle, a transverse row of longer and shorter spines behind the tubercle, and a corresponding row on the posterior segment of the carapace and on the five following fused tergal plates; some additional scattered spines on the terga, especially towards the middle line.

*Ocular tubercle* armed with four pairs of long and strong spines, unequally or subequally spaced, the first rising slightly above the level of the last.

Basal segment of *mandible* shorter than the oculiferous segment of the carapace, reaching as far forwards as the base of the femur of the palp; armed above with some seta-tipped tubercles and externally with about half a dozen strong curved spines; second segment unspined, subparallel when viewed from the front. *Palp* with femur rather strongly tubercular below; tarsus long and arcuate, as long as patella + tibia and perhaps a little longer than the femur. *Legs* with coxæ distally tubercular; trochanters spined externally and internally; femora studded with serially arranged sharp spiniform tubercles; patellæ apically spined above; tibiæ unspined, with flattened dorsal, ventral, and lateral surfaces, the angles being mostly rounded and hairy, not so sharply angular as in *P. opilio* for example.

♀. Larger than ♂; the spines on the carapace (but not on the tubercle<sup>1</sup>), abdomen, and appendages noticeably weaker. *Mandibles* smaller, the basal segment without external spikes or spines.

Measurements in mm.:—♂. Total length 5; length of chelicera 3, of palp 6; femur of 1st leg 5, of 4th leg 6.

♀. Total length 9; chelicera 3, palp 5; femur of 1st leg 4, of 4th leg 6.

*Loc.* S. Africa: Teafontein near Grahamstown (*Miss L. Leppan*). Also the young of the same or an allied species from Port Elizabeth (*Dr. R. Broom*).

This species apparently differs from *P. capense* Loman (*Zool. Jahrb.*, Syst. xi. p. 518, 1898), from Matjesfontein, in possessing normally not less than four pairs of ocular spines, instead of three; in having the tarsus of the palp as long as its patella and tibia taken together, instead of only about as long as the tibia; and apparently in the greater length of the legs—*i. e.* the type of *P. capense*, measuring 8 mm. long, has a second leg of nearly

<sup>1</sup> The number of ocular spines is variable; 4 + 4 seems to be the normal, but sometimes an extra small spine is added below in front or behind, so that there are not uncommonly five spines at least on one side. In one example there are six spines on one side and three on the other.



24 mm., whereas a female of *P. leppanæ* measuring 9 mm. has a second leg of 33 mm. in length.

The female of this new species is a genuine *Phalangium*, whereas the male approaches *Rhampsinitus*.

The genus *Rhampsinitus* Simon (CR. Soc. Ent. Belg. 1879, p. lxxii) appears to me to rest upon an insecure foundation. The species I have described below as *Phalangium* (*Rhampsinitus*) *telifrons* and *spenceri* differ from *P. leppanæ* only in the greater length of the mandibles and the greater size of the inferior spines of their basal segment in the male. It is permitted to doubt whether such a character should be granted generic rank.

*PHALANGIUM (RHAMPSINITUS) SPENCERI*, sp. n. (Text-fig. 79, A.)

*Colour* of trunk light olive-grey above, with a paler yellowish median longitudinal line, 1 mm. wide, extending from the ocular tubercle with a sinuous darker line external to it; chelicerae yellowish brown, indistinctly banded longitudinally, the spines on the basal segment black-tipped above, second segment mottled with darker spots without and within; legs yellowish red, darker apically; coxæ clouded with chalky white; abdominal sterna whitish.

Text-fig. 79.



*Phalangium* (*Rhampsinitus*) *spenceri*, ♂, and *P. (Rh.) telifrons*.

A. Carapace and mandible of male *P. (Rh.) spenceri*, and  
B. Carapace of *P. (Rh.) telifrons*.

*Upperside* of body finely and closely granular; carapace (text-fig. 79, A) with two pairs of spiniform teeth on each side of the tubercle, a few marginal by Krohn's stigmata, and many on the ante-ocular portion, that on the middle of the front border being conspicuous; the tubercle with *four* pairs of sharp spiniform teeth; a deepish transverse groove, followed by a row of spicules, running to the base of the 3rd leg behind the ocular tubercle; this is followed by six transverse segmental rows of sharp spicules,



the first of which runs to the base of the 4th leg; the remaining four terga without spicules.

*Mandibles* (text-fig. 79, A) with basal segment arcuate, thickly and strongly spicular above and internally, armed below, both externally and internally, with many long, strong, close-set spines; second segment stout, smooth except for some smallish spicules on the inner side at the base; the digits each with two larger spaced teeth and some smaller ones.

*Palpi* with a sharp spine at the base of the maxillary process, studded with short, stiff bristles; tarsus long, much longer than tibia + patella, at least as long as femur. *Legs* with femora, and to a lesser degree the trochanters, studded with numerous conical tubercles or spicules; a few also on the patella of the 3rd and 4th legs.

Measurements in mm.:—Total length 6.5; mandible about 9; palp 13; 1st leg 19, 2nd 29, 3rd 18, 4th 29 (approx.).

*Loc.* Natal (*H. A. Spencer*).

This species is evidently nearly related to *R. crassus* Loman (Zool. Jahrb. xi. Syst. p. 520, pl. 31. figs. 7–9) from the Cape Colony (*loc. ?*), but apparently differs in the much smaller number of spicules in front of the ocular tubercle, the disposition of the spines on the ocular tubercle, the anterior and posterior rising at the same level and both on a level with the eye, and the absence of an angular projection on the base of the second segment of the mandibles.

PHALANGIUM (RHAMPSINITUS) TELIFRONS, sp. n. (Text-fig. 79, B.)

♂. *Colour* yellowish brown, finely mottled with darker median dorsal band.

*Dorsal integument* closely granular; abdomen with transverse segmental series of sharp tubercles. *Ocular tubercle* longer than high, more than its own diameter from the anterior border of the carapace (text-fig. 79, B), armed with two rows of 5–6 conical tubercles, the largest on the summit subequal to the diameter of the eye; three denticles on the sides of the carapace between the ocular tubercle and the lateral impression, an oblique row external to them, frontal area furnished on each side with a cluster of about a dozen larger and smaller teeth; the middle of the anterior border with a longish, subcylindrical, horizontally directed spine.

*Mandibles* a little longer than the body; basal segment studded above with numerous sharp tubercles, smooth at the proximal and distal extremities; armed below, externally and internally, with a partially double series of about seventeen or more longer and shorter, mostly curved short spines, decreasing in length towards the distal end of the segment and more or less clustered together at its proximal end; second segment quite smooth except for a few small low tubercles on the upper inner angle, subcylindrical, a little wider at its widest than the second segment. *Palpi* simple, hairy; tarsus longer than femur, which is itself longer than

patella and tibia; a few low tubercles on the trochanter. Coxæ of 1st and 2nd legs with a few low tubercles; trochanters of 1st, 2nd, and 3rd legs with a few spines.

Measurements in mm.:—Total length 8; length of carapace (from anterior border to second groove behind tubercle) 2; basal segment of mandible 3·5, second segment 5, width of latter 1·6; length of palp 9.

*Loc.* Cape Colony: Jansenville (*Miss Leppan*).

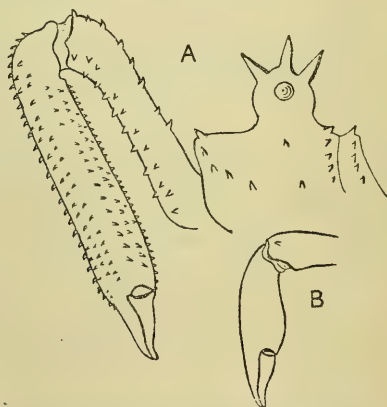
Differs from *R. spenceri* and *crassus*, to which it is nearly related, by the presence of a long porrect frontal spine, &c.

PHALANGIUM (*Rhampsinitus*) LEIGHI, sp. n. (Text-fig. 80.)

♂. *Colour* uniformly blackish brown throughout.

*Dorsal integument* finely and closely granular; carapace (text-fig. 80, A) with an oblique row of small tubercles on its lateral slope, a few marginal and a small one in the middle of the anterior border. *Ocular tubercle* about  $1\frac{1}{2}$  times its diameter from the anterior border, very high, surmounted by three long subequal, subequally spaced spines, the anterior and the posterior rising at nearly the same level and above the centre of the eye. Dorsal scute of *abdomen* with segmental rows of sharp tubercles. *Mandibles* (text-fig. 80, A) long, but variable in length, and

Text-fig. 80.



*Phalangium (Rhampsinitus) leighi*, ♂ ♀.

A. Carapace and mandible of male. B. Mandible of female.

slender, like those of *Macropsalis*, studded with spicules, which are larger, more numerous, and closer-set on the 2nd than on the 1st segment. *Palpi* unarmed, shortly hairy, femur subequal to the patella + tibia; tarsus rather longer. *Legs* with spicular femora.

♀. A little larger than ♂, yellowish white below. Mandibles quite small and smooth, except for a few apical tubercles on the basal segment (text-fig. 80, B).

Measurements in mm.:—(♂ type). Total length 6; length of carapace 2·3; basal segment of mandible 4, second segment 6; palp about 8; femur of 1st leg 10, of 2nd 16, of 4th 12·5.

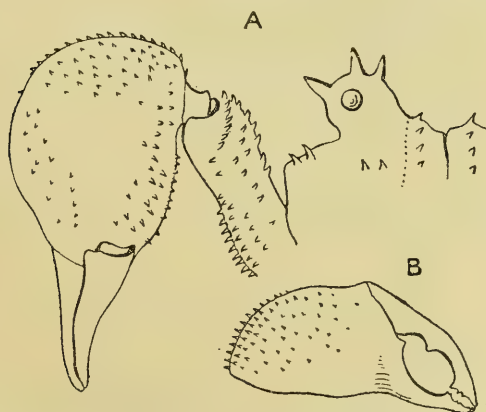
*Loc.* Durban (*G. F. Leigh*).

Resembling *R. minor* Loman, from Lower Illovo, Natal, in the presence of three pairs of spines on the ocular tubercle, but differing entirely in its much longer and strongly spicular mandibles.

PHALANGIUM (*GURUIA*) PALMATIMANUS, sp. n. (Text-fig. 81.)

♂. *Colour* of trunk blackish brown in the middle, pale at the sides; mandibles infusate; palpi and legs yellowish, partially infusate; trunk finely granular and segmentally spicular as in *P. (R.) spenceri*. *Ocular tubercle* higher, armed with three long spines on each side; only two or three small spicules on the ante-ocular area, no prominent one in the middle, one spicule external to the tubercle, three beyond it and some at the margin.

Text-fig. 81.



*Phalangium (Gurui) palmatimanus*, ♂.

A. Carapace and mandible of male. B. Anterior view of mandible of the same.

*Mandibles* (text-fig. 81, A & B) with basal segment sub-cylindrical, tubercularly spinous above, externally and below, the tubercles thicker and smaller below; second segment very large, subglobose, spicular, except internally; fingers long, widely separated, each with two large teeth and some smaller near the apex. *Palpi* with trochanter directed transversely, spicular; femur arcuate, with convexity external, spicular at apex above; patella tubercular above, with one external distal spicule, and an internal distal rounded projection, covered with short hairs; tibia a little longer than patella, tarsus longer than the sum of the two, with a small claw. *Legs* with coxæ, femora, and patellæ spicular;

tibia and protarsus of 1st also spicular, of 2nd, 3rd, and 4th scarcely so; tarsi of 3rd and 4th scopulate below, of 1st and 2nd less so.

Measurements in mm.:—Total length 6; mandible 9; palp 10; 1st leg 23, 2nd 43, 3rd 25, 4th 36.

*Loc.* East Africa: Mombasa (*D. J. Wilson*).

This species appears to fall into the genus *Gurui* of Loman (*Zool. Jahrb.* xvi. pt. 2, p. 172, 1902), judging by the form of the mandible, and the presence of three ocular spines. But the ocular tubercle is only separated from the anterior border of the carapace (text fig. 81, A) by a space equalling its own long diameter. It further differs from *G. frigescens* from Gurui in the larger size of the ocular spines, its longer legs, and in having the tarsus of the palp longer than the femur. It is also longer-legged than *G. levis* from Zanzibar, and further differs in the form of the mandible.

To distinguish *Gurui* from *Rhampsinitus*, Loman gives:—Legs shorter; palpi very slender, much weaker than the legs, partly concealed by the large mandibles; mandibles of male much longer than the body, with the second segment thickened and oval; ocular tubercle in the posterior part of the carapace, a little longer than high, armed above with three dissimilar denticles.

In *P. (G.) palmatimanus* the legs are much longer than in *P. (R.) spenceri*, and the palpi relatively shorter and slightly more robust. In neither are they partly concealed by the mandibles. In both the posterior slope of the tubercle rises on a level with the groove lying just in front of the first transverse row of tubercles on the carapace; and the frontal area of the carapace is relatively a little longer in *P. (R.) spenceri* than in *P. (G.) palmatimanus*, and the ocular tubercle is lower. The relative length of the mandibles in the two is about the same.

### Genus MACROPSALIS Sören.

#### MACROPSALIS HOGGI, sp. n.

♀. *Colour* yellowish brown, marbled with darker richer brown and spotted with white; palpi and mandibles pale, clouded with brown; legs pale, distinctly banded with brown.

*Carapace* with numerous scattered denticles before, behind, and beside the tubercle, a few more externally; tubercle with at least two rows of spicules.

*Mandibles* densely covered with spicules; fingers not crossing when closed. *Palpi* with patella shorter than tibia and without process. Trochanters of *legs* spinous in front; femora spinous, especially the anterior above and beneath; patellæ of 1st, 3rd, and 4th spinous above and below, especially that of 1st leg, of 2nd with two apical spicules above; tibia of 1st thickly spinous, of the rest smooth, that of the 2nd with spurious articulations.

♂. Differs from ♀ in having the second segment of the mandible much more sparsely and strongly denticulated in front, and the distal extremity of the patella of the palpus produced



into a process which is about one-fourth the length of the segment; 4th leg smooth.

Measurements in mm.:—♀. Length of carapace 2; of basal segment of mandible 6, second segment 7.

*Loc.* Macedon, in Victoria (*H. R. Hogg*).

The male specimen, which is unfortunately somewhat damaged, differs from that of the type of *M. serritarsus* (Sörensen) in the smaller size of the patellar apophysis of the palp.

### Genus PANTOPSALIS Sim.

#### PANTOPSALIS ALBIPALPIS, sp. n.

♂. *Colour* a tolerably uniform brown; palpi pale yellowish white.

*Carapace* with a few small spicules in front of the tubercle, and a few on the posterior slope of the latter.

*Mandibles* twice as long as the carapace, slender except for the club-like expansion of the distal end of the 2nd segment; spicular and tubercular all over. *Palpi* unarmed, patella and tibia subequal. *Legs* with trochanters unarmed; femora sparsely and weakly spicular, remaining segments unarmed except for some terminal spicules above on the patellæ.

Measurements in mm.:—Length of carapace 2·5; length of basal segment of mandible 11·5, distal segment 13.

*Loc.* New Zealand: Maungatua, S. of Dunedin (*J. V. Jennings*).

Whether or not this species is based on the male of *P. listeri* White (*P. Z. S.* 1849, p. 6, and Simon, *CR. Soc. Ent. Belg.* xxii. p. lxxiii, 1879) from the Middle Island, New Zealand, I am unable to say. The British Museum has two examples that I refer to *P. listeri* White, ticketed New Zealand ('Samarang'), and Grey-mouth, N. Zealand. In both, as in *P. albipalpis*, the palpi are pale as described by Simon, and the mandibles are much shorter and thicker than in the type of *P. albipalpis*. I infer that these examples are females on account of the resemblance in the structure of the mandible that they present to the female specimen referred to below as the female of *P. nigripalpis*.

#### PANTOPSALIS NIGRIPALPIS, sp. n. (Typical form.)

♂. *Colour* deep blackish brown; palpi as dark as the legs. Further differing from the preceding species in having the terminal portion of the second segment of the mandibles much less clavate, and the tubercles on the mandibles fewer and sharper.

Measurements in mm.:—Length of carapace 2; 1st segment of mandible 9, 2nd 10.

*Loc.* New Zealand: Dunedin (*G. M. Thomson*).

#### Subspecies SPICULOSA, nov.

♂. Coloured like the typical *P. nigripalpis*, from which it



differs, as also it does from *P. albipalpis*, in having the ocular tubercle and the area of the carapace in front of and at the sides of it much more thickly and strongly denticulated.

Measurements in mm.:—Length of carapace 2; of 1st segment of mandible 10, of 2nd 11.

*Loc.* New Zealand: West Taieri Bush, Otago (*J. V. Jennings*).

One male example without its legs.

There is also in the British Museum a female example with the mandibles much shorter and thicker than in the above described males, which may represent the female sex of either of the forms of *P. nigripalpis*. It was collected in Maungatua by Mr. J. V. Jennings.

### Suborder MECOSTETHI.

#### Group INSIDIATORES.

#### Family TRIENOBUNIDÆ.

#### Genus TRIENOBUNUS Sörens.

*TRIENOBUNUS PECTINATUS*, sp. n. (Text-fig. 84, C, p. 410.)

*Colour* blackish; legs variegated with yellow.

*Dorsal scute* depressed, ornamented with a network of granular ridges separated by smooth interspaces and showing a segmental arrangement behind the cephalic constriction, forming four transverse rows which pass between the five rows of tubercles; of these tubercles the median are the largest and recurved (text-fig. 84, C). *Ocular tubercle* directed upwards and forwards, long, spiniform, armed above with smaller procurved spiniform tubercles, below with one, and on each side with three long spines, the first close to its base, the third with its fellow giving a tridentate appearance to the tubercle; on each side of the tubercle there are five long strong spines. The first and second free *tergites* granular and armed, like the posterior border of the scute, with seven strong spines, one being median; the third tergite less regularly, but not less strongly spined; the fourth (anal) tubercular. *Sterna* with a transverse series of tubercles.

*Mandibles* weakly tubercular. *Palpi* shortish, not very strong, shorter than the dorsal scute; the femur with some hair-tipped tubercles above and three long spines below; tibia with two, tarsus with three pairs of interior spines.

*Legs* with coarsely granular coxæ, that of 1st shortly spined in front, of 2nd and 4th strongly spined above externally; trochanters and femora also spined, especially the femur of the 1st, which is armed with long, stout, close-set spines, those on the dorsal side forming a series, ten in number; patellæ and tibiæ tubercular, tubercles on the 1st leg more spiniform than those on the others; constricted portion of protarsus subconical; tarsal segments of 1st 3, of 2nd 6, of 3rd and 4th 4; ultimate segment of 3rd and 4th tarsus longer than the antepenultimate (second).

Measurements in mm.:—Total length 5; palpi 2·5; 1st leg 5, 2nd 9, 3rd 6, 4th 9.

*Loc.* Tasmania. A single specimen received from Mr. G. W. Peckham.

Certainly differing from *T. bicarinatus* Sörens. (Arachn. Austral., Opiliones, 1886, p. 60), from Sydney, in the strong spine-armature of the legs of the 1st pair. Sörensen, moreover, gives the tarsal segments as 3, 5, 3, 3.

### Family ADÆIDÆ.

#### Genus ADÆUM Karsch.

Karsch, Zeits. ges. Naturw. liii. p. 403 (1880); Loman, Zool. Jahrb. xi. Syst. p. 525 (1898).

#### ADÆUM AREOLATUM, sp. n.

♂. *Colour* yellowish brown, generally obscured by the mud or mould adhering to the granules. *Dorsal scute* with anterior border convexly rounded and thickly beset with cylindrical papillæ; ocular tubercle thickly granular, convexly rounded on the summit; behind the tubercle are two parallel rows of tubercles extending to the posterior border of the scute and forming segmental excrescences; midway between these and the lateral border is another irregular band of granules extending from the antero-lateral angle; there are also narrow transverse rows of granules extending across the scute from side to side and passing between the submedian granular excrescences; the interspaces between and defined by the bands of granules form subquadrate smooth depressed areas. The posterior border of the scute and of the three following tergites with a row of papilliform tubercles; the rest of the tergal plates thickly granular. *Sterna* granular anteriorly. *Coxæ* thickly granularly papillate. *Genital sternum* with seven long hair-tipped papillæ. *Sternum of cephalothorax*, the adjacent area of the 3rd coxa and the maxillary process of the 2nd coxa forming a smooth and shining depression flanked on each side by the papillæ arising from the coxæ.

*Mandibles* with basal segment granularly tubercular above, with one or two longer papillæ distally; second also with some sharp tubercles in front. *Palpi* thicker than the legs, thickly granular; the femur at the base on the inner side with four strong spines and one more distal, and beneath with one smaller and three strong spines, and one strong spine on the inner side inferiorly; tibia, patella, and tarsus subequal in length; the tibia without distinct and large paired spines beneath; tarsus with three pairs of longer spines in addition to the tubercles; claw short.

*Legs* tubercular and granular, unspined, even the femur of the 1st hardly spined below; some longish cylindrical papillæ on the outer side of the 2nd and 4th coxæ; tarsal segments 4, 11, 4, 4.

♀. Differs from ♂ in that the papillæ on the anterior border of the carapace are shorter and form a median angular projection;

the spines on the base of the inner side of the femur of the palp are much smaller, and the tibia is armed internally with longer hair-tipped papillæ.

Measurements in mm.:—(♂) Total length 7·5; palpus 5; 1st leg 8, 2nd 13, 3rd 9, 4th 12.

*Loc.* Grahamstown in S. Africa (*Dr. Schönland*).

This species at least differs from *A. obtectum* and *A. lutens* Loman, from Knysna, in having the ocular tubercle rounded on the summit instead of angularly acuminate, and also in the armature, at least of the femur of the palp, and apparently of the first leg, since Loman gives the presence of spines beneath the femur of this appendage as a generic feature. With *A. asperatum* Karsch, which was probably from Port Elizabeth, where Mr. I. L. Drège resides, it is not possible to make any comparison.

### Genus LARIFUGA Loman.

PHALANGIUM RUGOSUM Guér. (*Icon. Reg. Anim.* iii. Arachn. p. 12, pl. iv. fig. 4 (nec 4*a*–4*b*), 1829–1843<sup>1</sup>; also Gervais, *Ins. Apt.* iii. p. 128, 1844), the type of which was in Keyserling's Collection and is now preserved in the British Museum, belongs to the genus *Larifuga* Loman, but seems to approach rather nearer the genus *Adæum* than does the typical species *L. weberi*, since the sternum is apparently less sharply angular and therefore not so markedly pentagonal in shape. It further differs in that the ocular tubercle is not apically acuminate, but bears 4–5 tubercles on the summit; the dorsal scute is granular, with smooth transverse segmental areas separated by bands of granules arranged in 2–3 rows, each of the segments being marked by at least one pair of small submedian tubercles, those of the last being in line with a transverse row of coarse tubercles, while those of the first are almost lost amid the granules that lie behind the ocular tubercle—the tubercles, in fact, are practically the same in number and position as in *L. weberi*; anteriorly the carapace has one median porrect tooth and five large subvertical teeth above the anterior border. The three anterior free terga have a row of coarse tubercles, the first of them having as well a row of granules; the anal tergite has smaller, more scattered tubercles; there is a transverse row of granules on the sterna. Coxæ beset with scattered granules. The basal segment of the mandible with a distal row of fine tubercular teeth, the external the smallest. Trochanter of palp with three strong spines below; femur with about five, the two basal the largest but unequal.

<sup>1</sup> In Guérin's original description, reference is made to pl. iv. fig. 4*b*, which purports to represent the ventral surface of the specimen numbered 4. It is evident, however, that this drawing of the ventral surface is taken from some species of Phalangiidae and not from the specimen shown in fig. 4. This is clearly proved by the difference in the size of the palpi of the two. Fig. 4*b* probably represents the underside of the European Phalangium, the ocular tubercle of which is shown by fig. 4*a*.

## Family TRLENONYCHIDÆ.

The principal characters of the genera of this family in its restricted sense may be tabulated as follows:—

a. Ocular tubercle very high.....	<i>Acumontia</i> .
b. Ocular tubercle low.	
a <sup>1</sup> . Ocular tubercle upon or close to the anterior margin of the carapace.	
a <sup>2</sup> . Anterior area of dorsal scute shorter than the rest of its components taken together.....	[ <i>Nuncia</i> . <i>Trienonyx</i> &
b <sup>2</sup> . Anterior area of dorsal scute as long as the rest of its components taken together.....	<i>Diasia</i> .
b <sup>1</sup> . Ocular tubercle some distance behind the anterior border of the carapace.	
a <sup>3</sup> . Anteoocular portion of carapace horizontal; palpi strongly spined; claw of 3rd (? of 4th) leg strongly branched .....	<i>Sorensenella</i> .
b <sup>3</sup> . Anteoocular portion of carapace sloped downwards and forwards; palpi weakly spined; claws of 3rd and 4th legs weakly branched .....	<i>Lomanella</i> .

## Genus TRLENONYX Sörens.

TRLENONYX CORIACEA, sp. n. (Text-fig. 83, B & C, p. 408.)

♀. *Colour* deep brownish; legs yellow, clouded with black; mandibles and femur of palp black.

*Dorsal surface* (text-fig. 83, B & C) coriaceous, the segments of the carapace and abdomen each marked by an ill-defined series of low tubercles. *Ocular tubercle* conical, bluntly rounded, neither spinous, tubercular, nor granular. Abdominal *sterna* smooth.

*Mandibles* smooth above, basal segment a little longer than wide, with one apical tubercle above, second segment with a few granules. *Palpi* moderately robust, the trochanter with a pair of tubercles below; femur with a pair below the base and one near the distal end, about four, whereof two are spiniform, above and two or three internally; patella with one on the inner side beneath; tibia with three pairs of variously sized spines or tubercles; tarsus with two inner and three outer spines.

Coxa of 1st *leg* without spines or long tubercles, simply tubercular like that of the 2nd leg below; that of 3rd less tubercular, that of 4th nearly smooth below, some strong tubercles on the posterior side of the 2nd and anterior side of the 4th; groove between coxæ of 3rd and 4th tubercular; trochanters of 1st, 2nd, and 3rd weakly tubercular, femora of the same and tibia of 1st and 2nd also weakly tubercular; tarsus of 1st with three segments, of 2nd with eight, of 3rd and 4th with four; a pair of spines at the distal end of the protarsus of 1st, 3rd, and 4th; three distal segments of 3rd tarsus subequal in length, antepenultimate segment of 4th tarsus shorter than the sum of the two distal segments but longer than either.

♂. Differs from ♀ in having a strong cephalic constriction and the posterior portion of the body more elevated; the ocular tubercle triangular, more sharply pointed; the maxillary pro-



cesses of the second pair of legs longer and more pointed, and the spines on the palpi stronger.

Measurements in mm.:—(♀) Total length 5·5; palpus 4; 1st leg 7, 2nd 10, 3rd 6, 4th 10.

*Loc.* New Zealand: Auckland (*D. A. Steel*).

*TRIENONYX ASPERA*, sp. n.

*Colour* (dry) paler than *T. coriacea*. Shape of *body* much like that of the female of that species, the dorsal surface somewhat sparsely but coarsely granular. *Ocular tubercle* low, granular; free tergites with a row of subequal tubercles and some granules as well.

*Mandibles* with spine on basal segment, and spiniform tubercles on second segment.

*Palpi* much stronger and more strongly spined than in *T. coriacea*; femur convex above, and armed with about four spines and some tubercles, some tubercles externally, three long spines beneath externally and one smaller internally, two on the inner side distally; patella with one or two tubercles, and one internal and one external spine; tibia about one-fourth or one-third longer than the patella, smoother, armed with three pairs of strong spines and a smaller proximal one on the outer side; tarsus with four pairs of spines. *Legs* longer, femur of 1st armed above and below with strong tuberculiform spines, a few on the tibia also; tarsal segments 3, 13, 4, 4; the distal portion of the protarsus constricted to form a short spherical or nodular piece, quite different from the elongate subconical piece of *T. coriacea*.

Measurements in mm.:—Total length 5; of palpus 5; 1st leg 8, 3rd 7·5, 4th 12.

*Loc.* Australia.

*TRIENONYX SUBLEVIS*, sp. n. (Text-fig. 84, D, p. 410.)

*Colour* brownish; legs variegated with yellow.

Shape of *body* in profile intermediate between the male and female of *T. coriacea*, but the ocular eminence not so far forward, its anterior surface sloping backwards and upwards from a little behind the anterior edge of the carapace. *Dorsal scute* and *tergites* almost smooth, minutely coriaceous but with scarcely a trace of segmental tubercles or granules; no tubercles near the fore part of the cephalic area, merely the normal median spines. *Sterna* with the transverse row of tubercles nearly obsolete.

*Mandibles* with basal segment very long, subcylindrical, at least four times as long as broad, with a small posterior dorsal distal tubercle; second segment with a series of tubercles ending in one longer spine in front.

*Palpi* long and powerful; trochanter with a few short spines above and one long spine below; femur convex above, armed above and internally with dentiform tubercles, one on the inner side being spiniform, beneath with one long basal spine and some smaller spines or tubercles; patella with one inner spine; tibia



one-third longer than patella, with three long internal and two long external spines in addition to some smaller ones between and beyond the latter; tarsus with three internal and three external spines, the proximal external small; claw longish and slightly curved. *Coxa* of palp and of 1st leg bispinate in front; coxa of 1st and 2nd legs tubercular, the latter externally spinate; remaining coxæ nearly smooth, some tubercles on the posterior border of 3rd and 4th. Maxillary process of 2nd leg (text-fig. 84, D) double, consisting of a large quadrate tubercular process in addition to the normal process. Remaining segments of legs not spined, femora of 1st and 2nd at most tubercular; tarsal segments 3, 10 or 11, 4, 4; distal extremity of protarsi elongate, subconical.

Measurements in mm.:—Total length 6; palp 8; 1st leg 10, 4th 14.

*Loc.* West Taieri Bush, Otago, New Zealand (*J. V. Jennings*).

In a young specimen of this species (3.5 mm. long) the tarsus of the 1st leg is bisegmented, that of the 2nd bisegmented with merely indications of subsegmentation, those of the 3rd and 4th trisegmented, the distal segment of the 4th showing faint signs of subdivision; the sternum is more like that of *Adæum* in shape.

The known species of the genus from the Australian Region may be tabulated as follows:—

- |  |                  |
|--|------------------|
| a. Dorsal scute furnished posteriorly with transversely and metamERICALLY disposed series of granules and with one pair of spiniform tubercles ..... | <i>rapax.</i>    |
| b. Dorsal scute without metamERICALLY disposed rows of granules and no paired spiniform tubercles.   |                  |
| a <sup>1</sup> . Dorsal scute granular or coarsely coriaceous.   |                  |
| a <sup>2</sup> . Dorsal scute coriaceous; distal portion of protarsal segment of legs elongate, pyramidal .....                                      | <i>coriacea.</i> |
| b <sup>2</sup> . Dorsal scute coarsely and sparsely granular; distal portion of protarsus spherical and nodular .....                                | <i>aspera.</i>   |
| b <sup>1</sup> . Dorsal scute neither granular nor coarsely coriaceous .....   | <i>sublævis.</i> |

The species from Stephen's Isl., New Zealand, recently described by Loman (*Zool. Jahrb., Syst.* xvi. 1902, p. 214) as *Nuncia sperata*, is said to differ generically from *Trienonyx* in having the ocular tubercle large, convex and unarmed.

#### Genus ACUMONTIA Loman.

*Zool. Jahrb., Syst.* xi. p. 528 (1898).

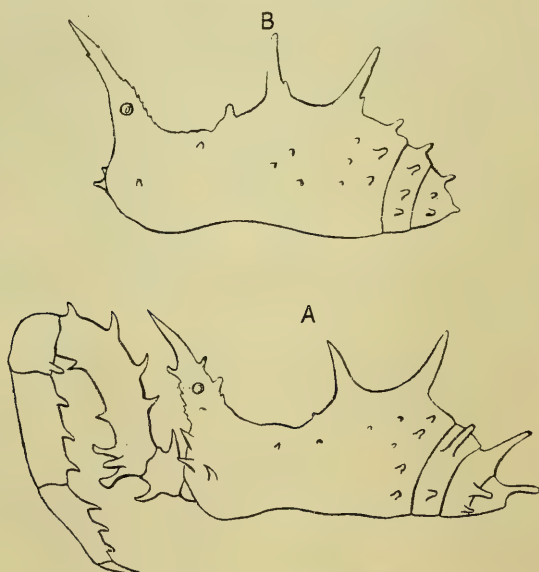
ACUMONTIA ROSTRATA, sp. n. (Text-fig. 82, p. 406.)

♂. *Colour* a uniform blackish brown.

*Dorsal scute* with lightly sinuous sides, granular, elevated posteriorly; armed in front on each side with three suberect spines in addition to the three, one median and one on either side, which project forwards between and externally to the mandibles (text-fig. 82, A). *Ocular tubercle* very high, armed with a few

tubercular spines and surmounted by a long pointed smooth process; the eye about the middle of the tubercular portion. The posterior elevated area armed with two pairs of long, suberect, divergent spines; a few scattered tubercles elsewhere, and a row of tubercles, of which one towards the lateral margin is larger, along the posterior border. First free *tergite* with one long spine midway between the middle and the lateral border, and one short submarginal spine; second with two shortish submarginal spines and one long submedian spine on each side; third with one long submedian spine on each side; for the rest the plates show a row of tubercles; anal tergite with a pair of subcentral, larger tubercles, a posterior median cluster, and some marginal tubercles. *Sterna* with a row of tubercles each.

Text-fig. 82.

*Acumontia rostrata*, ♂ ♀.

- A. Lateral view of dorsal surface and palpus of male.  
 B. " " " " of female.

*Mandibles* large, as thick as the palpi; basal segment with one superior spine, second segment with about half a dozen tubercular spines of varying size.

*Palpi* (text-fig. 82, A) very long and strong; trochanter with one large upper and under spine, a smaller external spine as well; femur arcuate, armed below with five spines, three of which are proximal, above with a series of four and one more internal, and internally with two; patella with one infero-external and two

internal tubercular spines; tibia and tarsus with three pairs of long and strong spines.

*Legs* with coxæ tubercular, that of the 1st with about three strong blunt spines; coxæ of 2nd and 4th pairs tubercular above; trochanter tubercularly spinous, that of the 4th with two longish superior spines; femur of 1st with three spines in its proximal half below, of the 3rd with spinous tubercles posteriorly. Tarsal segments of 1st leg 5, of 2nd 13-15, of 3rd and 4th 4.

♀. Smaller and more thickly granular; ocular tubercle less tubercular; dorsal scute without the anterior three pairs of spines, the long spines shorter than in the male and preceded by a pair of low tubercular spines; no long spines on the free tergites, but the tubercles all longer and more spiniform than in the male (text-fig. 82, B). *Palpi* shorter, but otherwise similar to those of male. Distal protarsal segment of 1st leg thickened but strongly excavated below.

Measurements in mm.:—♂. Total length of body 7; of palp about 12; 1st leg about 15, of 2nd about 25, of 3rd 27, of 4th 24.

*Loc.* Madagascar: Ambohimombo, in the Tanala district (*C. I. Forsyth Major*, type ♂); also Betsileo (*Deans Cowan*).

The specimens from Betsileo are three in number, an adult and two subadult females, the latter differing from the former in the absence of the emargination at the extremity of the protarsus of the 1st leg. They are distinguished from the typical examples from Ambohimombo by the shortness of the dorsal spines and tubercles, which are only about half as long as those of the female of the typical form of *A. rostrata*. I propose therefore to regard the Betsileo form as a subspecies which may be called *A. rostrata* subsp. *cowani* nov.

*A. rostrata* certainly differs from *A. armata* Loman in the spine-armature of the dorsal surface, the dissimilarity between the sexes with regard to spine-armature, &c.

It is noticeable that Loman makes no mention of the modification of the distal end of the protarsus of the 1st leg in either of the sexes of *A. armata*.

Judging, too, by the measurements given of the appendages, *A. armata* is a much shorter-legged form than either of the species here described. The following are the leg-lengths in millim. of *A. armata*:—1st leg 7·5, 2nd 11, 3rd 8·5, 4th 12.

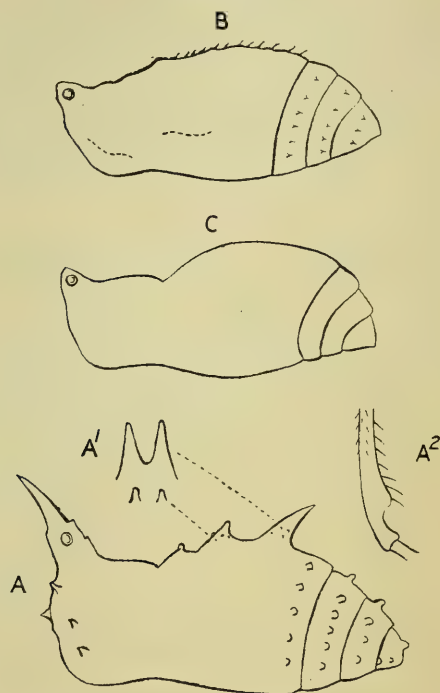
ACUMONTIA MAJORI, sp. n. (Text-fig. 83, A, p. 408.)

♂? *Colour* more ruddy brown than the foregoing.

*Dorsal scute* sparsely granular; ocular tubercle as high as in *A. rostrata*, but thicker at the base and less tubercular than in the male of that species; a pair of small spines on each side of the carapace near its fore border, in addition to the three projecting between and outside the mandibles; posterior area less elevated than in *A. rostrata*, and armed with two pairs of spines, the posterior long, the anterior short, directed obliquely

upwards and backwards, parallel, not diverging from each other (text-fig. 83, A, A<sup>1</sup>). A row of tubercles in front of the posterior border of the scute and of the free tergites; a submedian pair on the 2nd and 3rd of the latter larger than the rest. *Sterna* with a series of small tubercles.

Text-fig. 83.



*Acumontia majori*, ♀♀, and *Trienonyx coriacea*, ♀.

- A. Lateral view of dorsal surface; A<sup>1</sup>. Spines of the scute from above; and A<sup>2</sup>. Extremity of protarsus of 1st leg of female *Acumontia majori*. B. Lateral view of dorsal surface of female; and C. Lateral view of dorsal scute of male *Trienonyx coriacea*.

*Mandibles* with basal segment longer than in *A. rostrata*; second segment with a few antero-interior spiniform tubercles. *Palpi* similar to those of *A. rostrata*, but shorter; spines much the same except that the external spines on the tibia are short, tubercular, and much shorter than the internal which are very strong; tibia granular below; tarsus with four pairs of spines, the apical small.

Coxa of 1st leg strongly spined, of 2nd tubercular internally, of 3rd with one tubercle near the middle line, of 2nd and 4th

spinous above; trochanters not spiny; femur of 1st with some weak inferior spines, of the rest not spiny. Tarsus of 1st with 5, of 2nd with 12, of 3rd and 4th with 4 segments.

♀ (?). With three small tubercular spines on each side of the head-shield in front. Palpi a little larger, no spine on the dorsal side of the trochanter; femur with three strong dorsal spines, the distal one represented in the other sex obsolete, and one strong median internal spine. Distal end of protarsus of 1st leg incrassate, with the inferior distal half of the thickened area strongly emarginate.

Size about the same as that of *A. rostrata*.

*Loc.* Madagascar; Ambohimombo (*C. I. Forsyth Major*).

The specimen I have described as the male of this species is probably not quite adult. It is smaller than the other, and in the spine-armature of the palpi much more nearly resembles both sexes of *A. rostrata*. The other specimen I regard as the adult female, on account of the peculiar modification of the extremity of the protarsus of the 1st leg (text-fig. 83, A<sup>2</sup>), which also obtains in the specimen considered to be the female of *A. rostrata*.

The following is a key to the known species of *Acumontia*:—

#### Males.

- a.* Free abdominal tergites furnished with a few very long spines ..... *rostrata*.
- b.* Free abdominal tergites furnished with tubercles or short tuberculi-form spines.
  - a*<sup>1</sup>. Antero-lateral tubercles on the carapace very small, the posterior pair of spines on the dorsal scute close together, contiguous basally ..... *majori*.
  - b*<sup>1</sup>. Antero-lateral tubercles large; posterior dorsal spines shorter and widely separated basally ..... *armata*.

#### Females.

- a.* Two pairs of long subequal spines on posterior portion of dorsal scute; antero-lateral spines absent ..... *rostrata*.
- b.* Posterior two pairs of spines unequal, the anterior short.
  - a*<sup>1</sup>. Posterior spines basally contiguous ..... *majori*.
  - b*<sup>1</sup>. Posterior spines basally widely separated ..... *armata*.

#### Genus SORENSENELLA, nov.

Distinguishable from *Tricenonyx*, &c. by the situation of the ocular tubercle in the centre of the cephalic scute and behind its anterior margin. Lateral branches of claws of 3rd (probably also of 4th) leg considerably longer than the median branch—hence the tarsus appears to be *three-clawed*.

Type, *S. prehensor*.

SORENSENELLA PREHENSOR, sp. n. (Text-fig. 84, A, p. 410.)

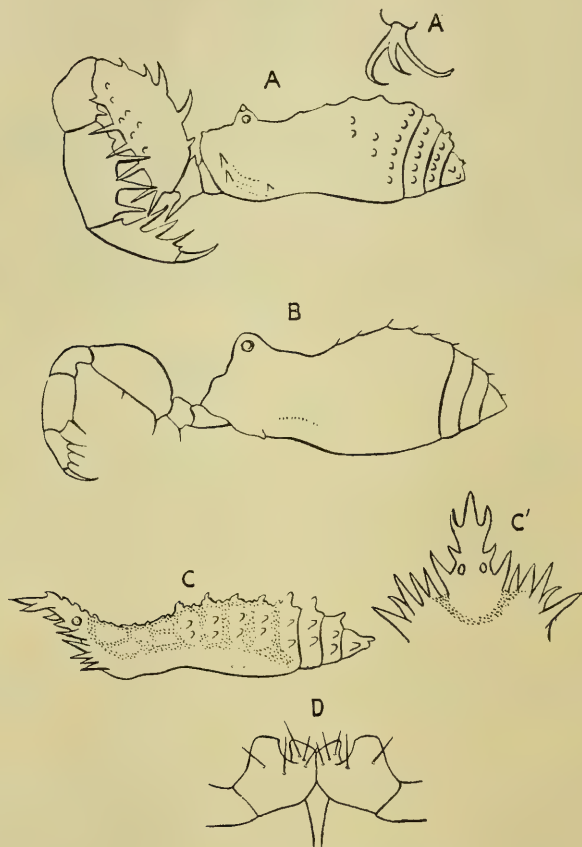
*Colour* uniformly brownish.

*Dorsal surface* (text-fig. 84, A) tolerably smooth; anterior border of cephalic scute mesially tridentate; three lateral spines on each side, the inner the largest, the posterior lying far back



above the basal articulation of the third leg; ocular eminence low, transverse, with a dentiform tubercle on its summit. Behind the ocular eminence the median and to a less extent the lateral area of the dorsal scute is segmentally tubercular, a

Text-fig. 84.



*Sorensenella prehensor*, *Lomanella raniceps*, *Trienobunus pectinatus*, and *Trienonyx sublævis*.

- A. Lateral view of dorsal scute and palpus; and A'. Claw of 3rd leg of *Sorensenella prehensor*. B. Lateral view of dorsal surface and palpus of *Lomanella raniceps*. C. Lateral view of dorsal surface; and C'. Anterior end of carapace, from above, of *Trienobunus pectinatus*. D. Maxillary lobes of 2nd pair of legs of *Trienonyx sublævis*.

row of tubercles running before its posterior border and before that of the two following free tergites. *Sterna* nearly smooth, with a nearly obsolete row of tubercles.

*Mandibles* (largely hidden from view) with a small tubercle on the basal segment, a much larger one on the proximal end of the second.

*Palpi* (text-fig. 84, A) very powerful; trochanter with short superior and a long inferior spine; femur robust, convex dorsally, and armed with four or five spines, externally furnished with a few tubercles, armed below externally with six long spines, its inner surface with about six longer and shorter spines; patella strongly constricted, with one short external and two long internal spines; tibia longer than patella, armed externally with three long spines and a basal tubercular spine, internally with four spines, the distal short; tarsus long, armed with three pairs of long spines, a pair of distal, and one proximal external tubercular spine.

Coxæ of *legs* granular; of 1st spined in front, of 2nd and 4th with one external spine; the rest of the segments unspined, nearly smooth; femur of 1st weakly tubercular below. Tarsal segments 3, 10, 4 (fractured on 4th leg); first and second segments of first tarsus subequal, the sum of them rather longer than the first or proximal segment; on the third tarsus the first segment as long as the sum of the other three, the second and fourth subequal, and either of them longer than the second.

Measurements in mm.:—Total length 3·5; palp about 6; of 4th leg 8·5.

*Loc.* New Zealand (*Dr. Richardson*).

There is in the British Museum a second well-marked species of this genus represented by a damaged specimen without indication of locality, which, for these reasons, I refrain from naming.

#### Genus LOMANELLA, nov.

Distinguished from the hitherto described genera of Triænonychidæ, with the exception of *Sorensenella*, by the position of the ocular tubercle some distance behind the anterior border of the dorsal scute; the area in front of the tubercle, however, falls obliquely downwards and forwards. Spiracles conspicuous, on a level with the middle of the distal half of the 4th coxa, which is not enlarged. Palpi weakly spined.

Type, *L. raniceps*.

LOMANELLA RANICEPS, sp. n. (Text-fig. 84, B.)

*Colour* blackish, dorsal surface (text-fig. 84, B) ornamented mesially with transverse yellow stripes, a large yellow patch above the bases of the 3rd and 4th legs; legs and palpi variegated yellow and black; sterna longitudinally banded black and yellow.

*Dorsal surface* closely, finely, and evenly granular all over, the fused and free terga indicated by transverse series of coarser granules; anterior border of scute evenly convex, with a process arising above the base of the 2nd leg, concave above the 3rd and 4th legs, then evenly convex to the middle line posteriorly.

*Mandibles* small, basal segment unarmed above, its distal end

forming a low rounded elevation ; second segment scarcely tubercular.

*Palpi* (text-fig. 84, B) long and robust ; femur strongly convex above, with a setiferous tubercle at the base below, and a smaller one near the middle of the inner surface ; patella without tubercles ; tibia convex below, one-third longer than the patella, armed beneath beyond the middle with a pair of setiferous tubercles ; tarsus armed with three pairs of setiferous tubercles, the distal the smallest.

Coxæ of *legs* granular like the dorsal surface, some larger granules on the posterior border of the 2nd, 3rd, and 4th legs ; rest of the leg-segments without spines ; femur of 1st tubercular beneath. Tarsal segments 3, 5, 4, 4 ; those of the 1st leg subequal, the second segment only slightly shorter ; of 3rd leg the first tarsal is about as long as the second and third, the third and fourth being subequal and slightly shorter than the second ; much the same proportion of segments prevails on the tarsus of the 4th leg.

Measurements in mm. :—Total length 2·5 ; palp 3 ; 2nd leg 7, 4th 6.

*Loc.* Tasmania. Specimen received from Mr. G. W. Peckham.

#### Group LANIATORES.

#### Family HINZUANIDÆ.

#### Genus HINZUANUS (Karsch) Loman.

#### HINZUANUS LEIGHI, sp. n.

*Colour* of trunk and legs yellow, thickly clouded with black, the mandibles mostly yellow ; femur and patella of palp yellow, distal segments infuscate, a pale ring round the femora and tibiæ of the legs.

*Trunk* thickly granular above and below ; no spiniform processes on the fore border of the carapace. *Eyes* large, distance between them much greater than that between either and the fore border of the carapace. A deep groove behind the carapace ; abdomen elevated, convex, its third and fourth segments with a pair of sharp submedian tubercular spines ; a row of large tubercles along the posterior border of the dorsal scute and of the following three tergal plates ; the anterior four tergites subequal in length. Femur of *palp* with a setiferous tubercle beneath ; patella with apical spine, tibia and tarsus with two pairs of spines. Tarsus of 1st leg with three, of 2nd to 4th with five tarsal segments.

Measurements in mm. :—Total length 4 ; width 2 ; height 2 ; 1st leg 7, 2nd 11, 3rd 8·5, 4th 12·5.

*Loc.* S. Africa : Natal (*G. F. Leigh*).

Distinguishable by the presence of the spiniform tubercles on the third and fourth tergites, a character suggestive of what occurs in the genus *Lacurbs*. Since *Hinzuanus*, according

to Loman, supersedes *Biantes*, the family name should be Hinzuaniidae.

Family ONCOPODIDÆ.

Genus PELITNUS, Thor.

PELITNUS PULVILLATUS, sp. n.

*Colour* a tolerably rich reddish brown, the dorsal side of the body sometimes infusate and contrasting with the paler appendages, the latter very indistinctly banded.

Differs from *P. annulipes* Poc. in the following particulars:—*Body* wider, the abdominal portion being almost as wide as long; its upper side more convex longitudinally, the first free tergite rising somewhat abruptly higher than the dorsal surface of the carapace, the third tergite the highest point of the body, excluding the ocular tubercle. Ocular tubercle erect, slender apically, separated from the posterior sulcus of the carapace by a space which at least equals its own basal diameter, its anterior border vertical. The 1st, 2nd, 3rd, 4th, and 5th sterna with their posterior half covered, except laterally, with a thick carpet of short, close-set hairs.

*Palpus* with its femur dorsally more tumid and more convex on the inner side; spine on lower side of trochanter of palp smaller than that on the femur, which is large and triangular; all the segments of the legs and palpi relatively shorter and stouter.

Measurements in mm.:—Total length 6; width 4.2; of 1st leg 8, 2nd 12, 3rd 9, 4th 13.

*Loc.* Malay Peninsula: Selangore. "In cave" (*H. N. Ridley*).

PELITNUS PILIGER, sp. n.

Nearly allied to *P. pulvillatus*, but with the upper side of the trunk blackish and contrasting strongly with the paler appendages, the mandibles and palpi being clear reddish yellow, without trace of infuscation; femora and tibiæ of the legs infusate. Body and appendages of the same relative size and form as in *P. pulvillatus*, but the postocular area of the carapace sloping upwards from the groove to the tubercle not horizontal, the tubercle itself wider than high, with a bluntly rounded summit. Spine on trochanter of *palp* longer, cylindrical, smaller than that of the femur, which is also cylindrical and curved forwards.

Measurements in mm.:—Total length 6; width 4.2; 1st leg 8, 2nd 12, 3rd 9, 4th 13<sup>1</sup>.

*Loc.* Malay Peninsula: Bukit Besar, 2500 feet alt. "Under bark of fallen tree" (*Annandale and Robinson*).

These two species differ from the previously described members of the genus in the presence of the transverse bands of coarse pubescence upon the abdominal sterna.

<sup>1</sup> In this and other cases the measurements of the legs do not include the coxae.



7. On the Australasian Spiders of the Subfamily  
*Sparassinae*. By H. R. HOGG, M.A., F.Z.S.

[Received November 4, 1902.]

(Text-figures 85-104.)

The members of this subfamily are abundant in all tropical and subtropical countries. Their large size and hairy appearance enable them to inspire a sentiment of fear out of all proportion to their really timid nature and defenceless character. This has no doubt acted as a means of protection to them.

Living originally about the trunks and under the loose bark of trees, they have adapted themselves readily to the shelter afforded by the houses of mankind, and find a congenial habitat under the eaves of most dwelling-houses. In fact, wherever an undisturbed dry and darkish receptacle is available they are sure to be discovered, and where allowed to settle prove valuable assistants in keeping down the numbers of the house-flies—the pest of all hot countries.

As members of the family Clubionidæ, they are furnished with unguis tufts, two well pectinated tarsal claws, scopulæ along both tarsi and metatarsi, and have the surface of the maxillæ convex, without any median depression.

The eyes, always eight in number, are disposed in two more or less parallel transverse rows of four each, without much variation in size or relative position.

In Australia the indigenous species have developed a distinctly characteristic type of genital organ. In by far the larger number the stylus in the male palp is produced into a flagellum of remarkable length, sometimes more than twice the length of the cephalothorax; this, for its protection, is curled spirally round a specially grooved drum, and this again has been formed by the rolling up of a riband-like elongation of a projection which, in the *Heteropoda* of a short columnar form only, has had its use as a feeler.

The two parts are quite separate and detachable and can be unrolled. This particular development is unique and, so far as I am aware, entirely confined to the Australian region. The flagellum part of it may be seen more or less developed in other forms such as *Pandercetes*, *Clastes*, and many of the Thomisidæ, and several earlier stages of the more perfect form can be seen, as will be described below.

From their habit of living between the bark and hard surface of trees, nearly the whole subfamily has had the position of the legs so modified as to move horizontally, thus enabling its members to shuffle along without raising the joints. They can thus obtain prey and shelter in narrow interstices where many of



their smaller fellows could not follow. In some instances both cephalothorax and abdomen have likewise become abnormally flattened, accompanied in the more pronounced forms such as *Delena* by a lateral extension of the eyes.

L. Koch originally included in this group the *Hemichloinae*, in consequence of a similar and even more exaggerated flattening of the whole body clearly arising from the same habits; but as they are an offshoot of another family, the Drassidae, they have been rightly separated by M. Simon, and I do not include them in the present paper.

The Australasian genera may be grouped as follows:—

- |  |              |
|--|--------------|
| A. Median eyes of the front row distinctly smaller than the laterals, being about three-fifths the diameter of the latter; the area of the four median eyes longer than broad. The highest part of the cephalothorax in the posterior one-third, thence sloping anteriorly; generally no flagellum in the male palp, or, if present, no spiral drum.   |              |
| α <sup>1</sup> . Rear row of eyes recurved; laterals protuberant .....   | HETEROPODEÆ. |
| α <sup>2</sup> . Rear row of eyes straight or procurved; lateral eyes sessile .....  | PALYSTÆ.     |
| B. Median eyes of the front row larger than, equal to, or only slightly smaller (about one-fifth of diameter) than laterals of same. The median-eye square not longer than broad (except in <i>Pediana</i> ). The stylus of the male palp produced into a flagellum, coiled round a supporting drum, which is spirally grooved for its reception. Cephalothorax either quite flat above or highest in front half, thence sloping posteriorly ..... | DELENEÆ.     |

#### Group HETEROPODEÆ.

The members of this group found in Australia at the present time, although probably more like the original type, from which the large bulk of the laterigrade spiders now inhabiting the continent must have been specialized, would seem to be of comparatively recent importation.

The species are all either to be found themselves or have near relatives in the islands to the North and East.

Entering evidently from Cape York, they are most numerous along the coast of Queensland and New South Wales, while a few isolated specimens have been recorded as far as the centre of Victoria, from Adelaide, and from Central Australia.

They show scant signs of compression, and the distance between the two rows of eyes is greater than in the more widely-spread indigenous types, while they are without the spiral conductor and generally without any elongated stylus in the male palp.

The genera may be distinguished as follows:—

- |   |                             |
|---|-----------------------------|
| A. Rear row of eyes only slightly recurved; median pair of same nearly as far apart as they are distant from the side eyes .....            | <i>Heteropoda</i> Latr.     |
| B. Rear row of eyes strongly recurved. Rear middle eyes about four times as far from the side eyes as from one another (sec. L. Koch) ..... | <i>Pandercetes</i> L. Koch. |

Genus *HETEROPODA* Latr.

*Heteropoda* Latreille, Nouv. Dict. Hist. Nat. xxiv. 1804, p. 135.

*Sarotes* Sund. Consp. Arach. 1833, p. 28.

*Ocyptete* C. Koch, Uebersicht des Arach. Syst. 1837, p. 27 (ad part.).

*Sarotes* L. Koch, Ar. Aust. 1875, p. 659.

*Heteropoda* Latr., Thorell, Rag. Mal. vol. i. 1877, p. 145 et al.

*Heteropoda* Latr., E. Simon, Hist. Nat. des Ar. 1897, vol. ii. p. 54.

L. Koch (*loc. cit.* p. 709 *et seq.*) described a good many species under the title of *Heteropoda*, none of which, as both Dr. Thorell and M. Simon have shown, conform to Latreille's genus, and they have been removed by M. Simon to *Sparassus* Walck. Furthermore, the species placed by L. Koch under *Sarotes* Sund. really belong to *Heteropoda* Latr., where they are now recorded. To these is added *H. lycodes*, described by Thorell from Cape York under its correct title.

[*Note*.—L. Koch had two species, described as *Sarotes badius* L. Koch (Ar. Austr. p. 662) and *Heteropoda badia* L. Koch (*l. c.* p. 712), both from the Island of Boeroe near New Guinea; as also *Heteropoda hemorrhoidalis* L. Koch (*l. c.* p. 726). Thorell also described *Sparassus hemorrhoidalis* Thor.

To avoid confusion, I may point out that

*Sarotes badius* L. K. becomes *Heteropoda badia* L. K.

? = *S. malayanus* Dol. (Thor. *l. c.* p. 277).

*Heteropoda badia* L. K. becomes *Sparassus badius* L. K.

? = *S. mygalinus* Dol. (Thor. *l. c.* vol. ii. p. 189).

*Heteropoda hemorrhoidalis* L. K. becomes *Sparassus hemorrhoidalis* L. K.

*Sparassus hemorrhoidalis* Thor. would therefore require a new name if not *Neosparassus punctatus* L. K. (see Thor. *l. c.* vol. iii. p. 259).

From Thorell's description *S. mygalinus* may belong to *Neosparassus*, nov. gen.]

The species may be distinguished as follows :—

A. Abdomen underneath whole-coloured, without any distinguishing markings.

$\alpha^1$ . Spines above on tibia iii. and iv.

$\alpha^2$ . On tibia iii. three spines, two on tibia iv. (*sec.* L. Koch) .....

*jugulans* L. K.

$\beta^2$ . On tibia iii. and iv. two spines (*sec.* L. K.) .....

*longipes* L. K.

$\beta^1$ . No spines above on tibia iv.

$\alpha^3$ . The median sulcus of cephalothorax short, not reaching down the rear slope (*sec.* L. Koch) .....

*suspiciosus* L. K.

$\beta^3$ . The median sulcus very long and reaching down the rear slope.

$\alpha^4$ . The front and rear middle eyes of equal size ...

*procerus* L. K.

$\beta^4$ . The rear middle eyes larger than the front middle .....

*lycodes* Thor.

B. The abdomen with distinct markings on the underside.

$\alpha^5$ . Two white stripes on a black shield .....

*cervina* L. K.

$\beta^5$ . No black shield.

$\alpha^6$ . Four narrow dark longitudinal lines; a two-toothed tibial spur on male palp .....

*regia* Fabr.

$\beta^6$ . A brown longitudinal stripe below genital fold...

*keysertiingi*, nov. sp.

## HETEROPODA JUGULANS (L. Koch).

*Sarotes jugulans* L. Koch, Die Arach. Austr. p. 852 (1876).*Heteropoda jugulans* L. Koch, E. Simon, Rev. Spar. 1880, p. 49.

Peak Downs, Queensland. ♂.

## HETEROPODA LONGIPES (L. Koch).

*Sarotes longipes* L. Koch, Die Arach. Austr. p. 660 (1875).*Heteropoda longipes* (L. Koch), E. Simon, l. c. p. 49.*Sarotes longipes* L. Koch, H. R. Hogg in Horn Exped. pt. ii. Zool. p. 339.Sydney, N.S.W.; ♂ (*Bradley*). Victoria (E. Simon Coll.). Alice Springs, Central Australia (Horn Expedition); ♀.

## HETEROPODA SUSPICIOSA (L. Koch).

*Sarotes suspiciosus* L. Koch, l. c. p. 665.*Heteropoda suspiciosa* L. Koch, E. Simon, l. c. p. 50.Upolu (*L. Koch*); Rockhampton (*L. Koch*); Newcastle (N.S.W. Mus.); Victoria (*E. Simon*).

## HETEROPODA PROCERA (L. Koch).

*Ocyptete procera* L. Koch, Verh. zool.-bot. Ges. Wien, p. 205 (1869).*Sarotes procerus* L. Koch, Die Arach. Austr. p. 667 (1875).*Sarotes procerus* L. Koch, F. Karsch in Zeitschr. ges. Nat. 1878, vol. li. p. 792.*Heteropoda procera* L. Koch, E. Simon, l. c. p. 50.Bowen, Brisbane, Sydney (*L. Koch*); Adelaide (*Karsch*).

## HETEROPODA LYCODES Thor.

*Heteropoda lycodes* Dr. T. Thorell, Ragni Mal. vol. iii. 1881, p. 282.

Cape York.

The co-types in the British Museum of this and *H. cyanognatha* Thor., from Yule Island, are not quite adult, but are undistinguishable from one another.

The measurements in millimetres are as follows:—

		Long.	Broad.	
Cephalothorax ...		6	$\left\{ \begin{array}{l} 3 \text{ in front.} \\ 5 \end{array} \right.$	
Abdomen .....		8		5
Mandibles .....		3 = front patella.		

		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.		
Legs .....	1.	2	7	8	7	=	24
	2.	2	$7\frac{1}{2}$	9	$7\frac{1}{2}$	=	26
	3.	2	6	7	6	=	21
	4.	2	7	7	7	=	23
Palpi.....		1	$2\frac{1}{2}$	$2\frac{1}{2}$	$3\frac{1}{2}$	=	$9\frac{1}{2}$

## HETEROPODA CERVINA (L. Koch).

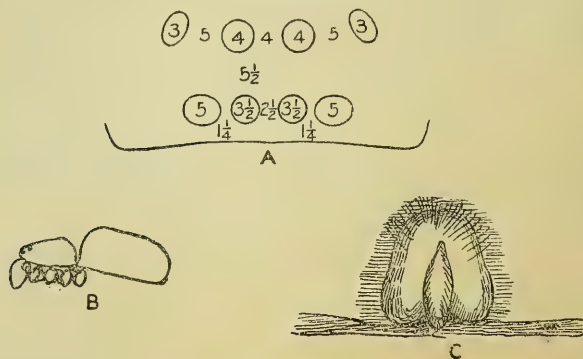
*Sarotes cervinus* L. Koch, Die Arach. Austr. p. 673.*Heteropoda cervina* L. Koch, E. Simon, l. c. p. 50.Rockhampton, Port Mackay, Bowen, Sydney (*L. Koch*); Peak Downs (*Keys.*).

## HETEROPODA REGIA (Fabr.).

*Aranea venatoria* Linn. Syst. Nat. edit. xii. p. 1035 (1758).*Aranea regia* Fabr. Ent. Syst. ii. p. 408.*Heteropoda venatoria* Linn., Dr. T. Thorell, Rag. Mal. ii. 1878, pp. 191, 205, iii. 1881, p. 274.*Heteropoda venatoria* Linn., E. Simon, Rev. Spar. 1880, p. 48.*Heteropoda regia* Fabr., E. Simon, Hist. Nat. des Ar. 1897, p. 54.

All tropical and sub-tropical regions.

Text-fig. 85.\*

*Heteropoda keyserlingi*.

A, eyes of female; B, profile; C, epigyne.

## HETEROPODA KEYSERLINGI, nov. sp. (Text-fig. 85.)

The cephalothorax is a rich reddish brown, with a curved brown patch around the rear slope; mandibles red-brown, with long pale brown bristles. Lip and maxillæ paler reddish brown, with dark brown hair on outer side of latter. Sternum orange with brown hair. Legs and palpi bright yellow-brown underneath, rather redder on upper side. Abdomen orange mottled with brown, a brown irregular patch in front; underneath paler orange, with a well-defined brown stripe from below the genital fold nearly to the spinnerets.

The cephalothorax is steep at the rear slope, thence runs in a straight slope to the eyes, rather narrow in front.

The front row of eyes is slightly recurved, the median pair

\* The figures inserted in the diagrams of eyes represent tenths of millimetres.

two-thirds diameter apart and one-third from the laterals, which are one and a half times the diameter of the former. The rear row, also recurved, has the median pair one diameter apart, slightly larger than the front median, one and a quarter diameter from laterals, which are as large as the front laterals, and about the same distance from front median. The clypeus equals the diameter of the front side-eyes.

There are four teeth on the lower edge of the falx-sheath and three on the upper.

There are two spines on the upper side of metatarsi iii. and iv., and a scopula to the base of the metatarsi on all legs.

The *abdomen* is oval, sparsely covered with short thin down-lying hair.

The *epigyne* is a chitinous oval frame, the median portion narrow anteriorly and widening to the base, completely filled with a long convex fold of tissue much larger than in *L. Koch's* drawing of *H. cervina*.

The measurements in millimetres are as follows:—

	Long.	Broad.
Cephalothorax ...	8	{ 4 in front. 7½
Abdomen .....	12	8
Mandibles .....	4 (longer than patella i.).	

		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.		
Legs .....	1.	3½	9	10	9	=	31½
	2.	3½	9	11	9½	=	33
	3.	3	8	9	8½	=	28½
	4.	3	9	9	9	=	30
Palpi.....		1½	4½	4½	4½	=	15

Two females from Peak Downs, Queensland, in Keyserling Coll., Brit. Mus., marked *H. cervina*.

#### Genus PANDERCETES.

*Pandercetes* L. Koch, Ar. Austr. 1875, p. 739; Thor., Ragni Malesi, 1881, p. 309; E. Simon, Hist. Nat. des Ar. vol. ii. p. 56 (1897).

Type, *P. gracilis* L. Koch.

PANDERCETES GRACILIS L. Koch, *loc. cit.* p. 740.

Described by L. Koch from male from Port Mackay, Queensland.

Thorell doubtfully ascribes to this species a male from Cape York (d'Albertis Coll.), and from same collection has two species—*P. isopus* from N. Guinea, and *P. longipes* from Jobi Island, on N. coast of same.

The male of *Pandercetes gracilis* L. K. has (*sec.* L. Koch and E. Simon) a long twisting flagellum on palp, but no supporting stylus or drum.



## Group PALYSTÆ.

The group *Palystes* is represented by *Palystes* only.

## Genus PALYSTES L. Koch.

*Helicopsis* L. Koch, Die Arach. Austr. i. p. 495 (1874).

*Palystes* L. Koch, Die Arach. Austr. vol. ii. p. 701 (1875);  
E. Simon, Rev. Spar. 1880, p. 42, et Hist. Nat. des Ar. vol. ii.  
p. 65 (1897).

Type species, *Palystes castaneus* (Latr.) (*P. frenatus* L. Koch).

PALYSTES IGNICOMUS L. Koch (*loc. cit.*).

Described from a female from New Ireland, east of N. Guinea.

In the British Museum are a male and female, brought by Mr. A. Willey from New Britain (same locality), doubtless the same as L. Koch's, and a female (Keyserling Coll.) from Brisbane, the latter not quite adult.

Of the former pair the female is much richer in colouring, pale yellow stripes on darker ground down the sides of the abdomen and two round black spots on back, with pale yellow spot in between. Underneath the deep orange femora are dark brown stripes reaching from the anterior end two-thirds of the distance to posterior end; a dark brown shield on the underside of abdomen below the genital fold.

The male, which is smaller, is uniformly pale orange and without any shield; the legs are much thinner, but nearly as long as those of the female.

In both specimens the front side-eyes are much larger than and touch the middle pair, which are half their diameter apart. Eyes all pale orange.

In the Brisbane specimen, which I first thought must be different, the colouring is not so deep, the dark stripes underneath femora are absent as in male above, and the abdominal shield much fainter. The rear row of eyes also is slightly procurved, in the others straight.

I append measurements (in millimetres) of all three :—

## Female (N. Ireland).

	Long.	Broad.
Cephalothorax ...	12	$\left\{ \begin{array}{l} 6\frac{1}{2} \text{ front.} \\ 10 \end{array} \right.$
Abdomen .....	14	9
Mandibles .....	5	= pat. i.

	Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.		
Legs .....	1. $4\frac{1}{2}$	15	18	$16\frac{1}{2}$	=	54
	2. $4\frac{1}{2}$	15	17	15	=	$51\frac{1}{2}$
	3. 4	$11\frac{1}{2}$	$12\frac{1}{2}$	$11\frac{1}{2}$	=	$39\frac{1}{2}$
	4. 4	$13\frac{1}{2}$	$13\frac{1}{2}$	$13\frac{1}{2}$	=	$44\frac{1}{2}$
Palpi .....	2	5	$5\frac{1}{2}$	4	=	$16\frac{1}{2}$

## Male.

	Long.	Broad.
Cephalothorax ...	8	$\begin{cases} 4 \\ 7 \end{cases}$
Abdomen .....	$8\frac{1}{2}$	5
Mandibles .....	$3\frac{1}{2}$	=less than front pat.

		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.		
Legs .....	1.	3	$14\frac{1}{2}$	$18\frac{1}{2}$ (5, $13\frac{1}{2}$ )	17	=	53
	2.	3	$14\frac{1}{2}$	17	17	=	$51\frac{1}{2}$
	3.	3	11	11	10	=	35
	4.	3	13	13	13	=	42
Palpi .....		$1\frac{1}{2}$	5	5	4	=	$15\frac{1}{2}$

## Female (Brisbane).

	Long.	Broad.
Cephalothorax ...	12	$\begin{cases} 7 \\ 10 \end{cases}$
Abdomen .....	13	9
Mandibles .....	5	

		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.		
Legs .....	1.	4	$14\frac{1}{2}$	$18\frac{1}{2}$	18	=	55
	2.	4	14	$18\frac{1}{2}$	$16\frac{1}{2}$	=	53
	3.	4	11	$12\frac{1}{2}$	12	=	$39\frac{1}{2}$
	4.	4	$13\frac{1}{2}$	$14\frac{1}{2}$	$14\frac{1}{2}$	=	$46\frac{1}{2}$
Palpi .....		2	5	6	5	=	18

## Group DELENEÆ.

I adopt *Delena* as the type genus of a group in preference to leaving the Australian genera incorporated with M. Simon's *Sparasseæ*, because the former genus exhibits the most complete type of differentiation both in its flattened form and in the Australian type of male palp. By the latter point these genera and *Neosparassus* are, as far as we have seen the males, entirely distinguishable from the type species of the genus *Sparassus* Walck. (*S. argelasius* of Southern Europe), so that for the Australian members of that genus I have established the new genus *Neosparassus*. To this, provisionally, I transfer those forms recently classed as *Sparassus*, but, until all the males have been proved to conform to it, its limits cannot be accurately defined, and it further remains a moot point whether any boundary-line can be drawn between it and *Isopoda*. The species at present associated with the genus will be those ascribed by L. Koch to *Heteropoda*, as above stated, erroneously. *Neosparassus diana* L. K. is a good representative of the genus. Through *N. salacius* L. K. it runs very closely into *Isopoda* L. K.

The latter genus, while very constant in the respective sizes of

its eyes as well as in the form of the male palp and epigyne of the female, has almost every intermediate gradation between a moderately curved and quite flat cephalothorax. The two undoubted species of *Holconia* Thor., *H. immanis* and *H. insignis*, differ from *Isopeda* solely in being the extreme representatives of the series in flatness of the cephalothorax, while in structural features they are otherwise undistinguishable. In the only specimens I can find to attribute to L. Koch's *H. dolosa*, the cephalothorax is not even noticeably flat, and a northern species, *H. subdola* Thorell, is only very doubtfully attributed by him thereto. I have therefore amalgamated the genus with *Isopeda* L. K.

In all the genera except *Pediana* the median eye-area is at least not longer than broad, generally distinctly broader, but in the latter it is longer than broad. For this reason, although the rear row of eyes is clearly procurved, it has been included by M. Simon among the *Heteropodæ*. *Isopeda horni* mihi belongs to this genus, and two new species from Western Australia bring the number of its members to four. I have not been able to obtain a male of any of my species; but the epigyne of the female is so distinctly of the *Isopeda* type, that it appears more probable than not that all the males will prove to be provided with a spiral flagellum and drum, and this is the case in *P. regina*, the type species, as described by Thorell. The first and second pairs of legs are nearly equal in length, and in the larger species are barely Laterigrade in mode of setting. The eye-space is raised up all round, and, although worthy of a distinctive genus, where it diverges from *Isopeda* it does so almost more in the direction of *Mithurga* Thor. than towards *Heteropoda* Latr.

Its beard alone could hardly, I think, entitle *Typostola* E. Sim. to rank as a separate genus, but the shortness of the palpal spiral distinguishes it from all the species of *Isopeda*, where the number of turns is generally about ten, but here only three.

A primitive *Delena* from King's Island (Bass's Straits), in which the spiral is quite rudimentary, both stylus and conductor making only a single turn, and the tibial apophysis is single instead of double, also necessitates a new genus. Except in its smaller size, it is otherwise scarcely distinguishable from *Delena cancerides* Walck., and clearly suggests the direction along which the present modification has been derived.

The genera may be separated as follows:—

- A. The middle eyes of the front row much nearer to one another than to the side-eyes, and clearly larger than the latter. Cephalothorax very flat and low. Pars cephalica divided from the thoracic part by deep impressions, forming an acute angle.

- $\alpha^1$ . Spiral of male palp having about ten convolutions. A double apophysis on anterior end of tibial joint .....  
 $\alpha^2$ . Spiral of male palp with only one convolution. Apophysis at anterior end of tibial joint single only .....

*Delena* Walck. (7)

*Eodelena*, nov. gen. (6)

- B. Eyes of front row differing slightly or not at all in relative distance. The side-eyes generally not smaller than the median.
- b*<sup>1</sup>. Median eye-space clearly longer than broad ... *Pediana* E. Sim. (2)
- b*<sup>2</sup>. Median eye-space not longer than broad.
- b*<sup>3</sup>. Cephalothorax clearly convex, generally set on to the abdomen at an angle so that the anterior portion is higher than the rear. Clypeus at least as broad as the front middle eyes ..... *Neosparassus*, nov. gen. (1)
- b*<sup>4</sup>. Cephalothorax flat on the top or only slightly convex, set on to the abdomen so that the front and rear portions are about level. Clypeus generally not so wide as front middle eyes.
- b*<sup>5</sup>. Cephalothorax longer than broad..... *Zachria*. (3)
- b*<sup>6</sup>. Cephalothorax not longer than broad.
- b*<sup>7</sup>. Inner side of mandibles and outer side of maxillæ covered with thick mat of hairs, many of which are bifid ..... *Typostola* E. Sim. (5)
- b*<sup>8</sup>. Having no special mat, but long hairs thinly covering the whole surface of the mandibles and maxillæ (except *I. vasta*). *Isopeda* L. Koch. (4)

#### Genus NEOSPARASSUS, nov.

*Heteropoda* L. Koch, Ar. Austr. 1875 (non Latr.).

*Heteropoda* F. Karsch, Zeitschr. f. ges. Naturwiss. 1878, p. 809, ad partem *H. patellata*.

*Sparassus* T. Thorell, Ragni Austro-Malesi, 1881, notes pp. 255, 274 (at least in part).

*Sparassus* E. Simon, Rev. Spar. (Actes Linn. Soc. Bordeaux, 1880); id. Hist. Nat. des Ar. vol. ii. p. 46 (1897) (in part).

Of the genera included in the group *Deleneæ* the members of this genus come nearest to *Heteropoda* Latr., with which they were included by L. Koch. Neither the cephalothorax nor abdomen show any signs of compression; the coloration and patterns are often vividly bright and varied, and the patterns of the female vulva are of rather diversified form, though roughly a sunken area, more or less divided longitudinally by a wedge-shaped ridge, enclosed in a chitinous frame. The male palps, however, in all the species of which I have been able to obtain specimens, are of the spiral conductor and flagellum type, more or less elaborated and varying from two or three spirals in *N. calligaster* Thor. and *N. diana* L. K., to nine or ten in *N. salacius* L. K.

The *cephalothorax* is generally high, the highest point of the curve being between the eye-space and middle of cephalothorax, thence sloping posteriorly, and in this differs from *Heteropoda* Latr., where L. Koch placed the species. Owing, however, to the angle at which the cephalothorax is often set on to the abdomen, the front part appears more prominent than it really is with respect to the plane of its legs.

Besides the palpal difference from the type species of *Sparassus*, they differ in having legs in order 2 1 4 3, instead of 4th longer



than 1st, and in not having the cephalothorax highest in posterior third. The front side-eyes are generally not larger than the median. Until we know the males of all the species now included provisionally, for which a good deal more collecting is required, we cannot settle the whole of the species for certain.

The species may be distinguished as follows:—

A. Side-eyes of front row larger than median.

Abdomen above and below pale yellow, with very fine hairs..... *magareyi*, nov. sp.

B. Side-eyes of front row not larger than median.

*a*<sup>1</sup>. Side-eyes of front row smaller than median.

*a*<sup>2</sup>. Abdomen underneath whole-coloured, without special markings.

*a*<sup>3</sup>. Abdomen twice as long as broad, a longitudinal median dark stripe the whole length of back (*sec.* L. Koch) ..... *macilentus* L. K.

*β*<sup>3</sup>. Abdomen at most 1½ times as long as broad, without the longitudinal median stripe above (*sec.* L. Koch) ..... *pallidus* L. K.

*β*<sup>2</sup>. Distinct markings on underside of abdomen.

*a*<sup>4</sup>. Shield-pattern behind epigyne

*a*<sup>5</sup>. black, with two white longitudinal stripes thereon (*sec.* L. Koch) ..... *pictus* L. K.

*β*<sup>5</sup>. reddish brown, darker anteriorly, bounded by pale brown border all round. Cephalothorax highest posteriorly ..... *thoracicus*, nov. sp.

*β*<sup>4</sup>. No black shield behind epigyne,

*a*<sup>6</sup>. but an orange-yellow transverse stripe (*sec.* L. Koch) ..... *præclarus* L. K.

*β*<sup>6</sup>. Underside of abdomen dark orange-yellow; in front of the spinnerets a broken transverse band of yellowish-white hair ..... *rutilus* L. K.

*c*<sup>6</sup>. Longitudinal brown median stripe on pale yellow ground from middle of back to spinnerets; irregular small dark brown spots on underside..... *inframaculatus* Hogg.

*β*<sup>1</sup>. Eyes of front row of equal size.

*a*<sup>7</sup>. Eyes of front row equidistant.

*a*<sup>8</sup>. Median sulcus wanting on cephalothorax ..... *festivus* L. K.

*β*<sup>8</sup>. Median sulcus clearly defined.

*a*<sup>9</sup>. On the underside of abdomen no black field,

*a*<sup>10</sup>. but two brighter longitudinal stripes..... *hæmorrhoidalis* L. K.

*β*<sup>10</sup>. four brighter longitudinal stripes ..... *incomtus* L. K.

*β*<sup>9</sup>. On the underside of abdomen a black field,

*a*<sup>11</sup>. with two white longitudinal stripes or spots.

*a*<sup>12</sup>. Inside the black field two white longitudinal stripes and a black stripe at base of abdomen on underside ..... *diana* L. K.

*β*<sup>12</sup>. The two white longitudinal stripes, one each side, but outside the black field ..... ? *pictus* L. K., var., or  
[n. sp.]

*β*<sup>11</sup>. No white spots accompanying the black field.

*a*<sup>13</sup>. The black field reaching two-thirds of way down ..... *calligaster* L. K.

*β*<sup>13</sup>. A straight black stripe halfway down on orange ground (*sec.* Karsch) ..... *patellatus* Karsch.

*c*<sup>13</sup>. The black field broken in the middle transversely, thus forming two ..... *salacius* L. K.

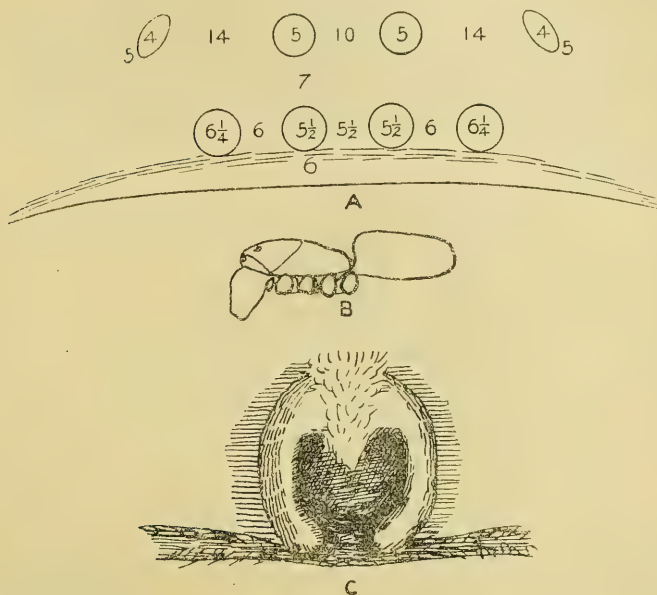
*β*<sup>7</sup>. The front middle eyes farther from the side-eyes than from one another.

*a*<sup>14</sup>. On the underside of the abdomen a black longitudinal field reaching to the spinnerets, but separated transversely in the middle (*sec.* L. Koch) ..... *conspicuus* L. K.



- $\delta^{14}$ . On the underside of the abdomen the black field reaching only two-thirds of distance to spinnerets, and bordered by two white lines (*sec. L. Koch*) ..... *punctatus* L. K.  
 $c^{14}$ . Two white longitudinal stripes on the underside, without a black field (*sec. L. Koch*) ..... *nitellinus* L. K.

Text-fig. 86.

*Neosparassus magareyi*.

A, eyes; B, profile; C, epigyne.

**NEOSPARASSUS MAGAREYI, nov. sp. (Text-fig. 86.)**

Cephalothorax dull red-brown, darker in eye-space, light yellow hair; mandibles black-brown, yellowish-white bristles; lip and maxillæ dark red-brown, light red fringes; sternum orange-brown, light orange hair; legs and palpi bright yellow-brown darkening towards extremities, light yellowish bristly hair; abdomen pale greenish yellow all over, rather thickly covered above with stout pale yellow hair, underneath finer and yellower; spinnerets yellow; epigyne brown; the femora underneath are yellow mottled with brown spots; the tibia yellow and brown, alternate bands.

The *cephalothorax* is 1 mm. broader than long, broad and truncate anteriorly, rising from the eye-space to nearly halfway, thence sloping posteriorly, the transverse section rises rather abruptly, fovea slight. The mandibles are long and powerful, longer than front patella, and thickly covered with long hair.

The front row of *eyes* is slightly procurved, the medians one diameter apart and slightly more from the side-eyes, the same from the margin of the clypeus, and more still than that from the rear median. The front side-eyes are clearly larger than the median. The rear row of eyes are equal and a little smaller than the front median, the middle pair two diameters apart and nearly three from the side.

On the underside of the falx-sheath are two very large, one median and one small tooth, one large and one small on upperside.

The *legs* are rather stout, and furnished with long and powerful spines on tibia iii. and iv., one each.

The *abdomen* is ovate, broadest one-third distance from front and tapering to spinnerets.

*Measurements in millimetres.*

		Long.	Broad.				
Cephalothorax ...		14	{ 9½ in front. 13				
Abdomen .....		15					
Mandibles .....		7	12				
				Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.
Legs .....	1.	5	15	17	16	=	53
	2.	5	16	18	17	=	56
	3.	4	13	13	12	=	42
	4.	4½	14	14	14	=	46½
Palpi .....		2	6	5	5	=	18

Numerous females, but no males, brought from the Northern Territory of S. Australia by Dr. Magarey in 1880. One female, and one male not fully developed, in Brit. Mus. from Port Stephen.

*NEOSPARASSUS THORACICUS*, nov. sp. (Text-fig. 87.)

This powerful spider I provisionally include in this genus, with which and with *Thecticopis* and *Isopeda* it has analogies, but differs in the shape of the cephalothorax; I think it ought to have a new genus but that it partially links the others.

The cephalothorax is red-brown, black-brown in front; mandibles, lip, and maxillæ black-brown, sternum and coxæ bright red-brown; legs and palpi somewhat darker, with long brown hair; the abdomen dark brown above and below.

The *cephalothorax* rises steeply from the sides, is highest posteriorly and slopes forwards to the eye-space, it is 2 mm. longer than broad and broadly truncate in front.

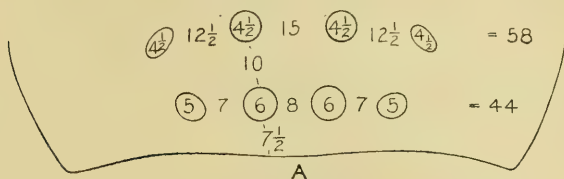
The front median *eyes* are about 1½ diameters apart, rather more from the rear median, one diameter from the laterals, which are clearly smaller. The clypeus is wider than the front median eyes. The rear row is procurved, the median eyes wider apart than from the laterals, which are about the same size as the front laterals, the median somewhat smaller,

The *mandibles* are long and stout.

The *abdomen* is oval, but the specimen is dried and it is stuffed with wool, and so the epigyne is destroyed. It is rather closely covered with thick short hair.

The *legs* are very stout, and altogether it is a formidable species.

Text-fig. 87.



*Neosparassus thoracicus*, ♀.

A, eyes; B, profile.

*Measurements in millimetres.*

		Long.	Broad.				
Cephalothorax ...		18	$\left\{ \begin{array}{l} 10 \\ 16 \end{array} \right.$				
Abdomen .....		22	17				
Mandibles .....		8					
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.		
Legs .....	1.	6	17	22	20	=	65
	2.	6	18	23	21	=	68
	3.	$5\frac{1}{2}$	$15\frac{1}{2}$	$16\frac{1}{2}$	$14\frac{1}{2}$	=	52
	4.	$5\frac{1}{2}$	16	17	17	=	$55\frac{1}{2}$
Palpi .....		$3\frac{1}{2}$	7	$8\frac{1}{2}$	6	=	25

One dried female in Brit. Mus. from N. Australia.

*NEOSPARASSUS MACILENTUS* (L. Koch).

*Heteropoda macilenta* L. Koch, Arach. Austr. vol. ii. p. 711.

One female from Bowen.

L. Koch thinks this should possibly be included in the genus *Isopeda*.

*NEOSPARASSUS PALLIDUS* (L. Koch).

*Heteropoda pallida* L. Koch, loc. cit. p. 713.

One male from Peak Downs.

NEOSPARASSUS PICTUS (L. Koch).

*Heteropoda picta* L. Koch, *loc. cit.* p. 714.

Australia (*L. Koch*). ? Var. Dimboola, Victoria (*Hogg*); ♀.  
? Adelaide and West Australia (*Karsch*).

NEOSPARASSUS PRÆCLARUS (L. Koch).

*Heteropoda præclara* L. Koch, *loc. cit.* p. 723.

Rockhampton and Gayndah; ♂ & ♀.

NEOSPARASSUS RUTILUS (L. Koch).

*Heteropoda rutila* L. Koch, *loc. cit.* p. 729.

Bowen; ♀.

NEOSPARASSUS INFRAMACULATUS (*Hogg*).

*Heteropoda inframaculata* *Hogg*, Rep. Horn, Exp. vol. ii. Zool.  
p. 343.

Central Australia.

NEOSPARASSUS FESTIVUS (L. Koch).

*Heteropoda festiva* L. Koch, *loc. cit.* p. 710.

Sydney; female undeveloped.

NEOSPARASSUS HÆMORRHOIDALIS (L. Koch).

*Heteropoda hæmorrhoidalis* L. Koch, *loc. cit.* p. 726.

Sydney; female undeveloped.

NEOSPARASSUS INCOMTUS (L. Koch).

*Heteropoda incomta* L. Koch, *loc. cit.* p. 727.

Sydney; ♀.

NEOSPARASSUS DIANA (L. Koch).

*Heteropoda diana* L. Koch, *loc. cit.* p. 730.

The male palpal spiral has about three turns. For the type of my new genus I have taken this very beautifully coloured species, or at any rate the specimens in my collection which I identify as *N. diana* (*L. Koch*).

Macedon, Dimboola, Victoria; Adelaide; Perth.

Widely distributed over the whole of the southern half of Australia.

NEOSPARASSUS CALLIGASTER (*Thor.*).

*Heteropoda calligaster* *Thorell*, Ar. nonnullæ Nov. Holl., Öfv. K. Vet.-Akad. Förh. 1870, no. 4, p. 385; L. Koch, Die Arach. Aust. p. 734.

Peak Downs, Queensland; Sydney, N.S.W. (*Koch*); Dimboola, Victoria (*H. R. H.*); Adelaide (*Karsch*).

## NEOSPARASSUS PATELLATUS (Karsch).

*Heteropoda patellata* F. Karsch, Zeit. ges. Naturw. Berlin, vol. li. 1878, p. 809.

*Sec.* Karsch, near the above-named *N. calligaster* (Thor.); but without any special distinction is a little doubtful.

*Loc.* Tasmania.

## NEOSPARASSUS SALACIUS (L. Koch).

*Heteropoda salacia* L. Koch, Die Arach. Aust. p. 737.

*Sparassus salacius* Thorell, Rag. Mal. vol. iii. 1881, p. 255.

This rather large species has a broad transverse black band in front of spinnerets as well as shield behind genital fold. The male palp flagellum has 10 spirals; and although the species is brightly coloured (yellow and black) like a *Sparassus*, it has very little to differentiate it from *Isopeda*.

Cape York; Rockhampton; Bowen; Peak Downs; Sydney; Upper Endeavour River, Queensland (*Hogg*).

## NEOSPARASSUS CONSPICUA (L. Koch).

*Heteropoda conspicua* L. Koch, Die Arach. Aust. p. 717.

Bowen; ♀.

## NEOSPARASSUS PUNCTATUS (L. Koch).

*Sparassus punctatus* L. Koch, Besch. n. Ar. & Myr., Verh. k.-k.-zool.-bot. Ges. Wien, 1865, p. 872.

*Heteropoda punctata* L. Koch, Die Arach. Aust. p. 719.

*Sparassus punctatus* Thor. Rag. Mal. vol. iii. 1881, p. 259.

Cape York (*Thor.*); Bowen, Port Mackay, Wollongong, Rockhampton, Peak Downs, Sydney (*L. Koch*); Dimboola, Victoria, Central Australia (*Hogg*).

## NEOSPARASSUS NITELLINUS (L. Koch).

*Heteropoda nitellina* L. Koch, Die Arach. Aust. p. 722.

Peak Downs; ♀.

## Genus ISOPEDA L. Koch.

*Isopeda* L. Koch, Die Arach. Austr. vol. ii. p. 678 (1875).

*Voconia* Thor. Araneæ nonnullæ Nov. Holl., in Öfv. Kongl. Vet.-Ak. Förh. 1870, no. 4, p. 383.

*Holconia* Thor. Rag. Mal. e Pap. vol. i. 1877, note p. 145.

*Isopoda* Thor. Rag. Mal. e Pap. vol. iii. 1881, note p. 293.

*Isopoda* E. Simon, Rev. Sparass. 1880.

*Holconia* E. Simon, Hist. Nat. des Ar. vol. ii. p. 44.

Type species, *Isopeda vasta* L. Koch.

This genus, both in number of specimens as a whole as well as of species (or subspecies), is by far the most largely represented of the group in Australia. Its limitations are not very clearly defined, but certainly include Thorell's genus *Holconia*. It would



appear to have been developed in Australia proper, and few of its members have strayed away therefrom.

The whole of its species have the male palpal spiral in its most fully developed form with about 10 spirals.

The *cephalothorax* is set on straight with the body; in altitude it is generally less than any member of the preceding genera, and in profile varies from a continuous curve highest about the middle to a flat surface. The latter form comprises two, or perhaps three, species hitherto known as *Holconia* (*Voconia*) Thor., but which, except for the flatter cephalothorax and consequently lower clypeus, differ in no particular from the rest of the *Isopoda*. Thorell himself was doubtful how to place his northern form, *H. subdola* Thor.; and in the only specimens I have seen to attribute to *H. dolosa* L. Koch, the cephalothorax is quite as normally rounded as many other species of *Isopoda*.

In a few instances the eyes of the front row, which is straight or slightly procurved, are all equal, but more generally the laterals exceed the median in diameter in the proportion of about 5 to 4. The rear row is also straight or slightly procurved, about a third longer than the front row, the rear median eyes always smaller than any of the others, and either rather nearer together than they are from the lateral, or equidistant.

The median eye-square is broader than long.

The cephalothorax is as broad as or broader than long and straight in front, where it is generally about two-thirds the greatest width. The legs always in the proportion 2 1 4 3.

NOTE.—The name *Isopoda* L. Koch has given rise to some discussion at various times in consequence of its being certainly wrongly formed from the Greek. Thorell and Simon set it down to a *lapsus calami* and boldly write *Isopoda*, but L. Koch uses his original form a score of times (and never any other) within a few pages of *Heteropoda*, also used by him over and over again. It certainly was no *lapsus calami* but deliberately intended. He probably knowingly spelt it wrongly to avoid clashing with the order of Crustacea *Isopoda*. The name is altogether a misnomer as applied to this genus, for no two pairs of legs of any of the species are alike in length.

The only species which had two pairs of legs (i. and ii.) of equal length has been removed to a new genus (*Pediana* E. Sim.), though for other reasons.

### *Synopsis of Genus Isopoda L. Koch.*

#### *Females.*

A. Sternum deep jet-black.

A<sup>1</sup>. Underside of abdomen whole-coloured, without any transverse dark stripe behind the genital fold.

a<sup>1</sup>. Eyes of front row equidistant.

a<sup>2</sup>. Distinguishable markings on back of abdomen.

a<sup>3</sup>. Three pairs of dark spots on whole-coloured back of abdomen; coarse hair on abdomen, rather coarse on cephalothorax; cephalothorax longer than tibia i. .... *frenchi*, nov. sp.

- $\delta^3$ . No spots, dark brown median scolloped stripe on back, fine hair on cephalothorax and abdomen; cephalothorax equal tibia i. in length.  
*leishmanni*, nov. sp.
- $\delta^2$ . No distinguishable markings on whole-coloured back of abdomen.
- $\alpha^4$ . No spines on upperside of tibia iii. or iv.  
 $\alpha'^4$ . A brown and yellow impressed shield-pattern on underside of abdomen.....*montana*, nov. sp.
- $\delta'^4$ . No shield pattern, darker and lighter mottlings (*sec.* L. Koch) .....*conspersa* L. K.
- $\delta^4$ . One spine on upperside of tibia iii., none on iv.; no pattern on underside of abdomen.  
*pococki*, nov. sp.
- $\delta^1$ . Median eyes of front row nearer to side-eyes than to one another.
- $\alpha^5$ . Median eyes of rear row nearer to one another than to laterals; two spines on tibia iii. above, one on tibia iv. ....*tepperi*, nov. sp.
- $\delta^5$ . Eyes of rear row equidistant; one spine each on tibia iii. and iv. (*sec.* L. Koch) .....*flavida* L. K.
- $B^1$ . A black transverse band behind the genital fold.
- $\alpha^6$ . Front median eyes less than their diameter from those of rear row .....*leai*, nov. sp.
- $\delta^6$ . Front median eyes *not* less than their diameter from those of the rear row.
- $\alpha^7$ . Eyes of front row equal and equidistant.
- $\alpha^8$ . Mandibles bare in front; one spine above on tibia iii. ....*vasta* L. K.
- $\delta^8$ . Mandibles more or less clothed with hair.
- $\alpha^9$ . Dark spot in front of abdomen; one spine on tibia iii. above .....*pengellya*, nov. sp.
- $\delta^9$ . A scolloped longitudinal stripe on back; two spines on tibia iii. above, none on tibia iv. ....*saundersi*, nov. sp.
- $\alpha^9$ . No pattern on back; two spines on tibia iii. above, one on tibia iv. ....*ardrossana*, nov. sp.
- $\delta^7$ . Eyes of front row not equidistant.
- $\alpha^{10}$ . Median eyes of front row nearer to side than to one another; one spine above on tibia iii.
- $\delta^{10}$ . Median eyes of front row nearer to one another than to side.
- $\alpha^{11}$ . No spines on tibia iii. or iv. above; four pairs of spots on back, median pairs joined .....*villosa* L. K.
- $\delta^{11}$ . One spine on tibia iii. above, none on iv.; no marks on back .....*tietzi*, nov. sp.
- B.** Sternum red-brown or yellow-brown or at least not black.
- $\alpha^{12}$ . Cephalothorax convex or at least slightly raised behind the eye-space and sloping posteriorly.
- $\alpha^{13}$ . Median eyes of front row clearly farther from the side-eyes than from one another.
- $\alpha^{14}$ . Front median eyes their diameter apart and same distance from the rear median .....*robusta* L. K.
- $\delta^{14}$ . Front median eyes  $\frac{3}{4}$  diameter apart and full diameter from the rear median; three pairs of spots on back, median pair a longitudinal line .....*woodwardi*, nov. sp.
- $\delta^{13}$ . Front row of eyes equidistant.
- $\alpha^{15}$ . The cephalothorax as long as tibia iv. (*sec.* L. Koch).....*hirsuta* L. K.
- $\delta^{15}$ . The cephalothorax longer than tibia iv.
- $\alpha^{16}$ . On femur i. in front four spines; cephalothorax about 3 mm. long (*sec.* L. Koch) ...*cordata* L. K.
- $\delta^{16}$ . On femur i. in front three spines at most.
- $\alpha^{17}$ . Abdomen above clothed with long, stiff, bristly hair (spider very large) .....*aurea* L. K.
- $\delta^{17}$ . Abdomen above clothed with fine hair only (*sec.* L. Koch) .....*flavibarbis* L. K.



males the front row eyes are equal and equidistant, about half their diameter apart, the median less than their diameter from the rear median.

The abdomen is bright yellow-brown above, with fine darker hair, sometimes forming a scoloped or transversely barred pattern; four pairs of muscle-spots not very clearly defined. The median pairs sometimes conjoined by a dark line.

It ranges over the southern half of the continent.

The following measurements in millimetres are from South Australian specimens:—

		Female.				
		Long.	Broad.			
Cephalothorax ...		15	15½			
Abdomen .....		24	17½			
Mandibles .....		7 shorter than front patella.				
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.	
Legs .....	1.	6	18	8, 14 (22)	20	= 66
	2.	6	21	27	24	= 78
	3.	6	16	16	16	= 54
	4.	6	16	16	16	= 54
Palpi.....	3		6½	6½	6½	= 22½

		Male.				
		Long.	Broad.			
Cephalothorax ...		12	12			
Abdomen .....		$11\frac{1}{2}$	$9\frac{1}{2}$			
Mandibles .....		$4\frac{1}{2}$				
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.	
Legs .....	1.	$4\frac{1}{2}$	16	19	19	= $58\frac{1}{2}$
	2.	$4\frac{1}{2}$	$18\frac{1}{2}$	22	21	= 66
	3.	$4\frac{1}{2}$	15	$16\frac{1}{2}$	15	= 51
	4.	$4\frac{1}{2}$	15	$16\frac{1}{2}$	$16\frac{1}{2}$	= $52\frac{1}{2}$
Palpi.....	$2\frac{1}{2}$		5	4	4	= $15\frac{1}{2}$

*Loc.* New South Wales; Victoria; South Australia; West Australia.

ISOPEDA IMMANS L. Koch. (Text-fig. 88, D, p. 434.)

*Delena immanis* L. Koch, Verh. z.-b. Ges. Wien, p. 208 (1867).

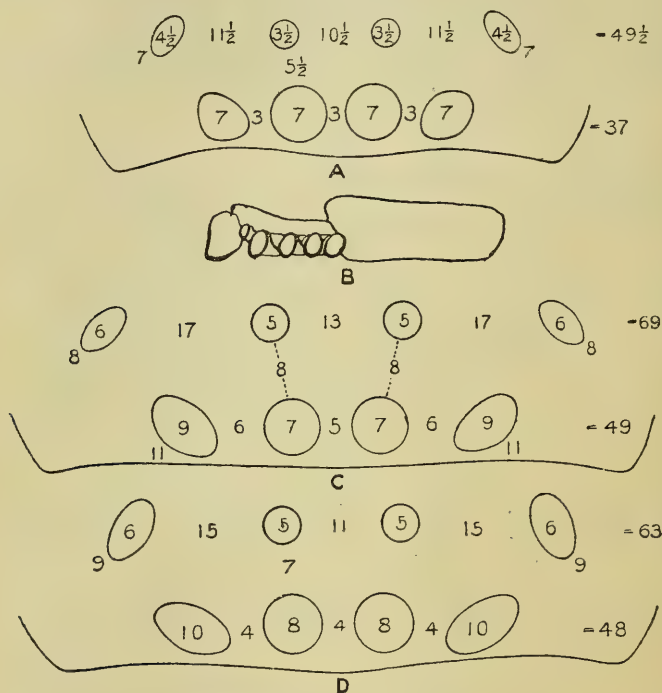
*Voconia immanis* L. Koch, Ar. Austr. 1875, p. 642.

*Holconia immanis* E. Simon, Rev. Spar. 1880, p. 26.

This is the northern form of the above, and, although Dr. Karsch quotes it from South and West Australia, out of a considerable number of specimens I have not myself seen one of *I. immanis* from the South, nor of *I. insignis* from the North of Australia. This form has a very characteristic dark stripe on the back of the abdomen, reaching from the front two-thirds of the distance to the rear. In other respects the two species differ very little. The distance between the front and rear median eyes in the

female is generally less than the diameter of the front median (as in the male), sometimes equal; the diameter of the front laterals varies from about equal to that of the median to  $1\frac{1}{4}$  of same. The colour of the back varies from yellow-brown to dark grey.

Text-fig. 88.

*Isopeda insignis* and *I. immanis*.A, eyes of male; B, profile; C, eyes of female of *I. insignis*.D, eyes of female of *I. immanis*.

Female (J. J. Lister, S. Queensland).

		Long.	Broad.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
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## Male (Keyserling Coll. in Brit. Mus.).

		Long.	Broad.			
Cephalothorax ...		13	13			
Abdomen .....		14	10			
Mandibles .....		6				
				Pat. & tib.	Metat. & tars.	
Legs .....	1.	Covae. 5	Tr. & fem. 18	23 (7, 16)	22½	= 68½
	2.	5	21	27	25	= 78
	3.	5	14	18	16½	= 53½
	4.	5	14	18	18	= 55
Palpi.....		3	5	5	7	= 20

*Loc.* Queensland and New South Wales.

ISOPEDA DOLOSA L. Koch.

*Voconia dolosa* L. Koch, Arach. Austr. 1875, p. 648.

L. Koch described this species from two dried specimens in the Museum at Stuttgart, labelled "Australia" only. The differences by which he says it may be distinguished from *I. insignis* Thor., are that "the clearly smaller median eyes of the front row are more than their diameter from the rear median," and the joining by a dark longitudinal marking of the two median pair of muscle-spots on the back. The latter feature seems a by no means uncommon variation in any species, whenever the back spots are specially well developed, and the former is almost universally the case with females of *I. insignis* Thor. I have therefore great doubts as to it being really a separate species; if it is, the joining of the back spots is its only distinctive character. The Horn Expedition had several specimens from Central Australia, both male and female, with back-markings as described, very flat cephalothorax, but front row of eyes equal, and I have similar from Victoria, otherwise the same as *I. insignis*.

ISOPEDA SUBDOLA Thor.

*Holconia subdola* Thorell, Rag. Mal. e Pap. vol. iii. 1881, p. 304.

Thorell himself describes this as a doubtful species, the only difference from Koch's description of *H. dolosa* being in the coloration of the back of the abdomen,

From Cape York, N. Queensland.

ISOPEDA CONSPERSA L. Koch.

*Isopeda conspersa* L. Koch, Arach. Austr. 1875, p. 689.

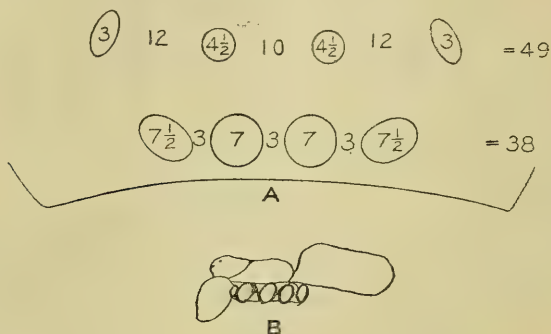
From Cape York.

ISOPEDA FRENCHI, nov. sp. (Text-fig. 89, p. 436.)

*Female*.—The cephalothorax is red-brown with yellow hair, the mandibles rather darker with bright red fringes. Lip and maxillæ black-brown. Sternum jet-black, with velvety-black hair

extending over nearly the whole of the coxæ. The abdomen is yellow-brown, somewhat lighter underneath, and three pairs of dark spots visible on upperside; four impressed longitudinal lines behind epigyne. Legs and palpi red-brown with yellow hair; a nearly black spot on the underside of tibiæ i. and ii. anteriorly, remainder silvery. Scopulæ grey.

Text-fig. 89.

*Isopeda frenchi.*

A, eyes of female; B, profile.

The *cephalothorax* in front is two-thirds its greatest width.

The front row of *eyes* is equal and equidistant, half a diameter from margin of clypeus. The distance between front and rear median greater than the diameter of front eyes. Rear median farther from the side-eyes than from one another.

On tibia iii. above are two spines, none on tibia iv.

The hair on the abdomen is somewhat coarse.

*Measurements in millimetres.*

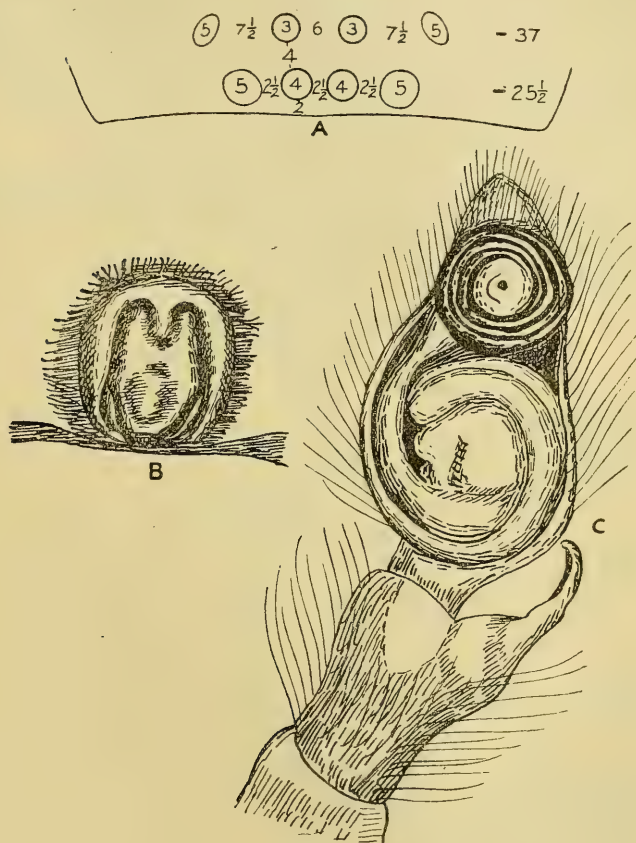
		Long.	Broad.	
Cephalothorax ...		11	$\left\{ \begin{array}{l} 6\frac{1}{2} \text{ in front.} \\ 11 \end{array} \right.$	
Abdomen .....		14	11	
Mandibles .....		5	= front patella.	
		Coxæ.	Tr. & fem.	Pat. & tib.
Legs .....	1.	5	$12\frac{1}{2}$	$13\frac{1}{2}$
	2.	5	$13\frac{1}{2}$	15
	3.	5	10	$11\frac{1}{2}$
	4.	5	11	$11\frac{1}{2}$
Palpi.....		2	$4\frac{1}{2}$	$4\frac{1}{2}$
				Metat. & tars.
				$13\frac{1}{2}$ = $44\frac{1}{2}$
				$13\frac{1}{2}$ = 47
				10 = $36\frac{1}{2}$
				$11\frac{1}{2}$ = 39
				$4\frac{1}{2}$ = $15\frac{1}{2}$

Three females and one undeveloped male from Dimboola, Victoria, I have named after Mr. C. French, Government Entomologist of Victoria, from whom I received them.

Three females in the South Australian Museum Collection from

Victoria have the same proportions, but there are no visible spots on the back, the sternum and coxæ are dark brown and not black, the hair on the abdomen is rather finer, with wavy darker and lighter streaks on the sides of the abdomen, and one spine only instead of two on tibia iii. I do not think these differences are sufficient to justify a new species.

Text-fig. 90.

*Isopeda leishmanni*.

A, eyes; B, epigyne; C, male palp.

*ISOPEDA LEISHMANNI*, nov. sp. (Text-fig. 90.)

*Female*.—Cephalothorax and mandibles red-brown, with yellowish-grey hair. Lip and maxillæ red-brown. Sternum dark brown, with nearly black hair. Abdomen dingy reddish brown with greyish-yellow hair, lighter on the underside. A darker brown median longitudinal stripe with scoloped pattern is just

visible. Legs and palpi red-brown, with thin long greyish-yellow hair; the coxæ the same colour.

The *cephalothorax* is slightly broader than long, and as long as tibia i., in front not quite two-thirds its greatest width. The thoracic fovea is deep and long, the divisions between the cephalic part and thoracic scarcely visible; the cephalothorax sloping gently from sides to middle, is rounded but not high.

The front row of *eyes* are equidistant, two-thirds the diameter of the front median apart, the side larger than the median, which are their diameter from the rear median and half that from margin of the clypeus. The rear median are farther from the laterals than from one another. The first tooth on inner side of falx-sheath is larger than the other.

There is one spine above on tibia iii., none on iv.

The *male* has no distinguishable stripe on back; the front eyes are equal and equidistant, rather more than half a diameter apart, their diameter distant from the rear middle, which are farther from the side than from one another.

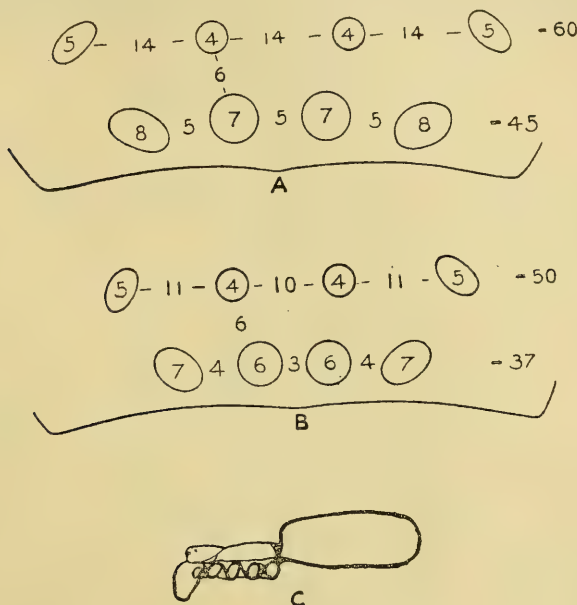
Two spines above on tibia iii. and one on tibia iv.

*Measurements in millimetres.*

Female.						
		Long.		Broad.		
Cephalothorax ...		9		$\left\{ \begin{array}{l} 6 \\ 9\frac{1}{2} \end{array} \right.$		
Abdomen .....		15		10		
Mandibles .....		$4\frac{1}{2}$ less than front patella.				
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.	
Legs .....	1.	4	12	$5, 8\frac{1}{2}$ ( $13\frac{1}{2}$ )	$12\frac{1}{2}$	= 42
	2.	4	12	15	$13\frac{1}{2}$	= $44\frac{1}{2}$
	3.	4	$9\frac{1}{2}$	10	$9\frac{1}{2}$	= 33
	4.	4	$10\frac{1}{2}$	11	11	= $36\frac{1}{2}$
Palpi.....		2	$4\frac{1}{2}$	4	$4\frac{1}{2}$	= 15
Male.						
		Long.		Broad.		
Cephalothorax ...		$11\frac{1}{2}$		$\left\{ \begin{array}{l} 6\frac{1}{2} \\ 11\frac{1}{2} \end{array} \right.$		
Abdomen .....		13		12		
Mandibles .....		$6\frac{1}{2}$ = patella i.				
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.	
Legs .....	1.	$5\frac{1}{2}$	16	$6\frac{1}{2}, 13\frac{1}{2}$ (20)	18	= $59\frac{1}{2}$
	2.	$5\frac{1}{2}$	17	$21\frac{1}{2}$	19	= 63
	3.	$5\frac{1}{2}$	14	15	13	= $47\frac{1}{2}$
	4.	$5\frac{1}{2}$	14	16	15	= $50\frac{1}{2}$
Palpi.....		$2\frac{1}{2}$	$5\frac{1}{2}$	4	5	= 17

Albany, King George's Sound, W. Australia (*Mrs. Leishmann*). A male from Perth, W. Australia, is larger and legs slightly longer in proportion, but otherwise not distinguishable (in Brit. Mus. Coll., sent by Mr. H. W. J. Turner).

Text-fig. 91.

*Isopeda montana*.

A, eyes of female; B, eyes of male; C, profile (of female).

### ISOPEDA MONTANA, nov. sp. (Text-fig. 91.)

*Male & Female*.—Cephalothorax and mandibles red-brown, with yellow-brown hair; lip and maxillæ black-brown with pale front edges. Sternum black-brown with dark brown hair, but not extending over coxæ; the latter, legs and palpi light red-brown, with pale brown upstanding hair. Abdomen dingy yellow-grey above, somewhat mottled, rather thick, long, fine grey or yellow-grey hair, with a dark brown spot in front, and three pairs of muscle-spots. Underside greyish yellow, with brown circles round gill-covers, and brown streaks forming a distinct shield-pattern. White underneath patella and lower half of tibia i. and ii.

The *cephalothorax* slopes gradually from the sides, flat above; fovea long, divisions between thoracic and cephalic parts scarcely distinguishable. Cephalothorax as long as tibia i.; mandibles shorter than patella i.



The front row of *eyes* is straight, nearly equidistant, three-fourths of a diameter apart, their diameter between front and rear median; rear median farther from side than from one another in male, equidistant in female. Clypeus one-third of front median.

The first tooth on inner side of falx-sheath large, two next moderate, fourth very small.

There are no spines above on tibia iii. and iv. The metatarsal joint of tibial palp of male is distinctly broad.

*Measurements in millimetres.*

		Male.					
		Long.	Broad.				
Cephalothorax ...		10	$\left\{ \begin{array}{l} 6 \\ 11 \end{array} \right.$				
Abdomen .....		$11\frac{1}{2}$	$8\frac{1}{2}$				
Mandibles .....		5					
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.		
Legs .....	1.	4	13	5, 11 (16)	15	=	48
	2.	4	14	18	16	=	52
	3.	4	11	$12\frac{1}{2}$	11	=	$38\frac{1}{2}$
	4.	4	11	13	$12\frac{1}{2}$	=	$40\frac{1}{2}$
Palpi.....		2	$4\frac{1}{2}$	$3\frac{1}{2}$	$4\frac{1}{2}$	=	$14\frac{1}{2}$

*Female (not fully developed).*

		Long.	Broad.				
Cephalothorax ...		$8\frac{1}{2}$	$\left\{ \begin{array}{l} 5 \\ 8\frac{1}{2} \end{array} \right.$				
Abdomen .....		$9\frac{1}{2}$	6				
Mandibles .....		$3\frac{1}{2}$					
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.		
Legs.....	1.	3	$10\frac{1}{2}$	12	11	=	$36\frac{1}{2}$
	2.	3	$11\frac{1}{2}$	15	12	=	$41\frac{1}{2}$
	3.	3	9	10	9	=	31
	4.	3	9	10	10	=	32
Palpi .....		$1\frac{1}{2}$	4	3	4	=	$12\frac{1}{2}$

*Loc.* Macedon, Victoria.

*ISOPEDA POCOCCI*, nov. sp. (Text-fig. 92.)

Cephalothorax dark red-brown; mandibles, lip, maxillæ, and sternum almost black-brown. Legs and palpi dark red-brown, with brown hairs all over. Abdomen yellow-brown above, reddish brown underneath; very thick, long, coarse hair; no pattern.

The *cephalothorax* is rather sloping at the sides, steep at rear, convex above. A long fovea followed by a depression almost to second row of eyes. Cephalic side-depressions clearly marked.

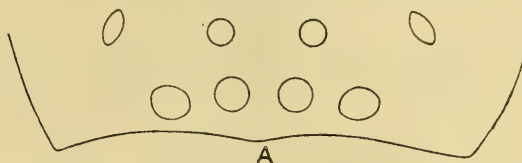
The front row of *eyes* is slightly procurved, equidistant; side-

eyes larger than median, the latter slightly more than their diameter from those of the rear row, which are nearer to one another than to their laterals. Clypeus about equals diameter of front median eyes.

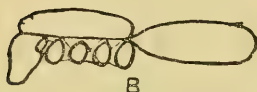
One spine on tibia iii. above, none on tibia iv.

The metatarsal scopula only reaches halfway to base on i., ii., and iii., one-fourth on iv.

Text-fig. 92.



A



B

*Isopeda pococki.*

A, eyes; B, profile.

*Measurements in millimetres.*

Female.

	Long.	Broad.
Cephalothorax ...	14	{ 9 14
Abdomen .....	18	12
Mandibles .....	7	= front patella.

		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.		
Legs .....	1.	6	16	7, 11 (18)	17	=	57
	2.	6	18	19	19	=	62
	3.	5	16	15	13	=	49
	4.	5	15	15	15	=	50
Palpi.....		3	6	5	5	=	19

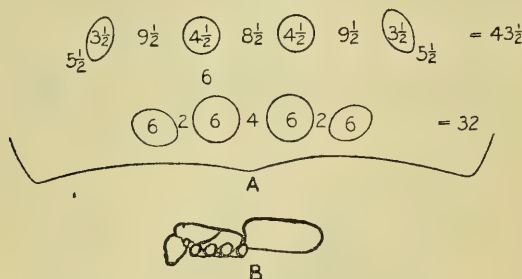
Male.

	Long.	Broad.
Cephalothorax ...	12	{ $7\frac{1}{2}$ 12
Abdomen .....	12	7
Mandibles .....	$5\frac{1}{2}$	shorter than front patella.

		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.		
Legs .....	1.	5	17	7, 13 (20)	19	=	61
	2.	5	19	23	21	=	68
	3.	4	14	16	14	=	48
	4.	4	15	16	16	=	51
Palpi.....		2½	5	4	6	=	17½

Two dried specimens, Australia only, in Brit. Mus. Coll.

Text-fig. 93.



*Isopeda tepperi*.

A, eyes of female; B, profile.

*ISOPEDA TEPPERI*, nov. sp. (Text-fig. 93.)

This species differs very slightly from Thorell's and L. Koch's description of *Isopeda pessleri* Thor. But it has no transverse stripe behind the genital fold. In the Adelaide specimens the front side-eyes in the female, as in the male, are somewhat larger than the median, and the latter nearer to the side than to one another. Two spines above on tibia iii. and iv. instead of one. In the Kangaroo Island female the front row eyes are all equal, and tibia iv. has only one spine, which brings it still nearer to *I. pessleri*.

The *cephalothorax* is red-brown; the mandibles, lip, and sternum black-brown with yellowish hair and bristles.

The *sternum* is black, with black hair extending over the two front coxæ and partially over the two rear.

The *abdomen* is yellowish-brown, with rather coarse matted hair, three pairs of muscle-spots showing on the upper side, and a slightly impressed shield-pattern on the under.

*Measurements in millimetres.*

Female.

	Long.	Broad.
Cephalothorax ...	9	{ 6 9
Abdomen .....	11	8
Mandibles .....	4	shorter than pat. i.

		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.		
Legs .....	1.	4	10	$4\frac{1}{2}$ , 7 ( $11\frac{1}{2}$ )	$10\frac{1}{2}$	=	36
	2.	4	11	13	11	=	39
	3.	4	9	9	8	=	30
	4.	4	$9\frac{1}{2}$	$9\frac{1}{2}$	$9\frac{1}{2}$	=	$32\frac{1}{2}$
Palpi .....		2	4	3	3	=	12

## Male.

		Long.	Broad.				
Cephalothorax ...		9	$\left\{ \begin{array}{l} 5 \\ 9 \end{array} \right.$				
Abdomen .....		8	$5\frac{1}{2}$				
Mandibles .....		4 =	pat. i.				
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.		
Legs .....	1.	4	11	5, 9 (14)	$12\frac{1}{2}$	=	$41\frac{1}{2}$
	2.	4	12	$14\frac{1}{2}$	$13\frac{1}{2}$	=	44
	3.	4	10	11	10	=	35
	4.	4	$10\frac{1}{2}$	$11\frac{1}{2}$	$11\frac{1}{2}$	=	$37\frac{1}{2}$
Palpi .....		2	$3\frac{1}{2}$	3	$4\frac{1}{2}$	=	13

*Loc.* ♂ & ♀, Adelaide (*Noack*); ? Kangaroo Island (*Tepper*).

## ISOPEDA FLAVIDA L. Koch.

*Isopeda flavida* L. Koch, Die Arachn. Austr. 1875, p. 686.

In the Keyserling Collection, British Museum, is a non-adult male, and I have several females (all young) apparently the same from Macedon, Victoria. The eyes are green on black rims. On all (young) there is one spine above on tibia iii. but none on tibia iv.

The measurements of Keyserling's male are as follows:—

		Long.	Broad.				
Cephalothorax ...		5	5				
Abdomen .....		4	3				
Mandibles .....		2					
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.		
Legs .....	1.	2	$6\frac{1}{2}$	$8\frac{1}{2}$	$7\frac{1}{2}$	=	$24\frac{1}{2}$
	2.	2	$6\frac{1}{2}$				
	3.	2	6	$6\frac{1}{2}$	6	=	$20\frac{1}{2}$
	4.	2	$6\frac{1}{2}$	$6\frac{1}{2}$	$6\frac{1}{2}$	=	$21\frac{1}{2}$
Palpi .....		$1\frac{1}{2}$	2	2	3	=	$8\frac{1}{2}$

*Loc.* Bowen, Sydney, Macedon.

## ISOPEDA VASTA L. Koch.

*Isopeda vasta* L. Koch, Die Arachn. Austr. 1875, p. 681.

In the Keyserling Collection is an adult male and subadult female, both from Brisbane.

The mandibles of both are smooth and broad, the female remarkably rounded and kneed at base.

There is a black sloping streak at the base of femur i., and a similar dark brown streak at base of tibia i.

In both sexes a spine on tibia iii. above, none on iv.

*Measurements in millimetres.*

		Female.				
		Long.	Broad.			
Cephalothorax ...		$8\frac{1}{2}$	{ $5\frac{1}{2}$ $8\frac{1}{2}$			
Abdomen .....		$11\frac{1}{2}$	$8\frac{1}{2}$			
Mandibles .....		4	$2\frac{1}{2}$			
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.	
Legs .....	1.	3	9	$4\frac{1}{2}$ , $6\frac{1}{2}$ (11)	10	= 33
	2.	3	$10\frac{1}{2}$	$12\frac{1}{2}$	11	= 37
	3.	3	7	9	7	= 26
	4.	3	8	9	9	= 29
Palpi .....		2	$3\frac{3}{4}$	3	3	= $11\frac{3}{4}$

		Male.				
		Long.	Broad.			
Cephalothorax ...		7	7			
Abdomen .....		$7\frac{1}{2}$	$5\frac{1}{2}$			
Mandibles .....		3	2 = pat. i.			
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.	
Legs .....	1.	3	10	$12\frac{1}{2}$	12	= $37\frac{1}{2}$
	2.	3	12	$14\frac{1}{2}$	14	= $43\frac{1}{2}$
	3.	3	$9\frac{1}{2}$	8	8	= $28\frac{1}{2}$
	4.	3	10	$8\frac{1}{2}$	10	= $31\frac{1}{2}$
Palpi .....		2	4	$2\frac{1}{2}$	$4\frac{1}{2}$	= 13

*ISOPEDA PESSLERI* Thor.

*Isopeda pessleri* Thor. Ar. non. Nov. Holl., Öfv. K. Vet.-Akad. Förh. 1870, no. 4, p. 684.

*Isopeda pessleri* L. Koch, Die Arachn. Austr. 1875, p. 684.

Loc. Queensland and New South Wales. Some South (Adelaide Mus.) and Central (Horn Exp.) Australian specimens are very close to this, but larger, and probably not the same.

*ISOPEDA VILLOSA* L. Koch.

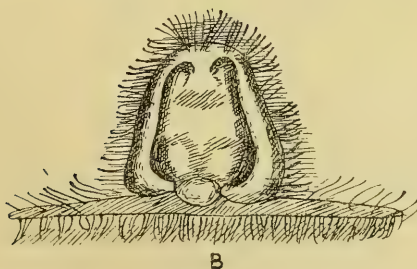
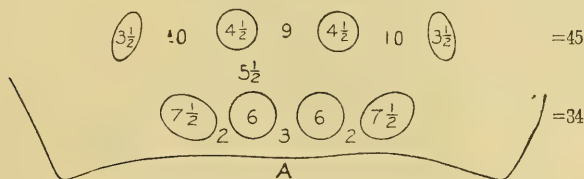
*Isopeda villosa* L. Koch, Die Arachn. Austr. 1875, p. 687.

Loc. Sydney (L. K.). Specimens from Victoria and South Australia I attribute to this—they have eight spots on back, two middle pairs conjoined; also a female sent by Dr. Broom from Muldiva, Queensland. The latter measures in millimetres:—



		Long.	Broad.			
Cephalothorox ...		12½	{ 8 12½			
Abdomen .....		19		14		
Mandibles .....		6				
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.	
Legs .....	1.	4½	12½	6½, 9½ (16)	14½	= 47½
	2.	4½	14½	18	15½	= 52½
	3.	4½	12	12	10½	= 39
	4.	4½	12½	12½	11	= 40½
Palpi .....		3	4½	5	4¾	= 17

Text-fig. 94.

*Isopeda leai.*

A, eyes of female; B, epigyne.

*ISOPEDA LEAI*, nov. sp. (Text-fig. 94.)

*Female*.—The cephalothorax and mandibles are red-brown, the latter with greyish-yellow bristles; the lip and maxillæ dark brown; sternum black-brown, the dark hair spreading over the coxæ. The abdomen is pale brown, with a darker brown scolloped longitudinal stripe above; yellow with brown irregular spots below; a faint dark stripe behind epigyne. The legs and palpi are reddish covered with fine silky brownish-yellow hair. The underside of patella and middle of tibia i. and ii. silvery white, brown each end; scopulæ dark grey.

The *cephalothorax* is rounded, moderately high, depression

between cephalic and thoracic parts well marked, median sulcus rather long.

The front row of *eyes* is straight, the laterals are larger than the median, which are half their diameter apart and the same or rather less from the side; the clypeus barely one-third their diameter; the front and rear median are barely the diameter of the latter apart, the diameter of the rear three-fourths of front; rear row straight; middle eyes two diameters apart and slightly more from the laterals.

The teeth on the inner falx-sheath are three large and one very small.

One spine above on tibia iii., none on tibia iv.

*Measurements in millimetres.*

		Long.	Broad.				
Cephalothorax ...		9	{ 6 in front. 9				
Abdomen .....		16	10½				
Mandibles.....		4 less than front patella.					
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.		
Legs .....	1.	3½	10	4½, 9½ (12)	12	=	37½
	2.	3½	12	13	12	=	40½
	3.	3½	9	10	9	=	31½
	4.	3½	9½	10	10	=	33
Palpi .....		1½	4	3½	3½	=	12½

One female from Adelaide, sent to Brit. Mus. by Rev. T. S. Lea.

This species is rather close to *I. frenchi*, nov. sp., from Victoria, and *I. saundersi*, nov. sp., from West Australia, both of which have the same deep velvety-black sternum, the colour extending partly over the coxæ. It differs from both in a rather smaller cephalothorax, in the eyes of both front and rear rows being nearer together, the side-eyes larger than median of front row, and closer together than in the former.

*ISOPEDA ARDROSSANA*, nov. sp. (Text-fig. 95.)

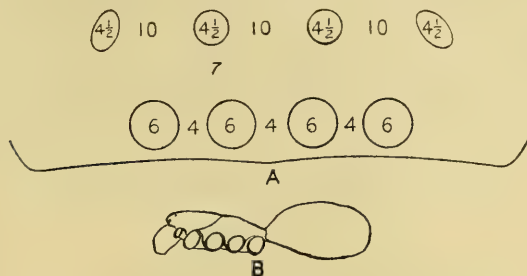
*Female*.—The cephalothorax is red-brown; mandibles dark red-brown with long pale yellow hair; lip and maxillæ dark brown; sternum black-brown with long thick hair extending over coxæ. The abdomen is dingy yellow-brown above, paler below, with a transverse black band behind the epigyne. The legs and palpi are bright orange with long silky hair, darker bands on tibiæ i., ii., and iii., silver in between and under patella; scopulæ dark grey.

The *cephalothorax* is flatter than in *I. leai*, to which also it is rather close, but the front-row eyes are equal and equidistant, two-thirds of their diameter apart; the medians rather more

than their diameter from those of the rear row, which are also equidistant, more than twice the diameter of rear median apart, these are three-fourths the diameter of front eyes; clypeus one-half of front median.

There are two spines above on tibia iii. and one on tibia iv., of one leg only, the other having no mark.

Text-fig. 95.

*Isopeda ardressana*.

A, eyes of female; B, profile.

*Measurements in millimetres.*

		Long.	Broad.			
Cephalothorax ...		11	{	6½		
				11		
Abdomen .....		16		11		
Mandibles .....		5 = front patella.				
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.	
Legs .....	1.	4	13	14½	13	= 44½
	2.	4	14	17	14	= 49
	3.	4	11½	12	10½	= 38
	4.	4	11½	13	12	= 40½
Palpi .....		3	4½	4	4½	= 16

One female in South Australian Museum Collection, sent by Mr. E. H. Cadd from Ardrossan, South Australia.

*ISOPEDA PENGELLYA*, nov. sp. (Text-fig. 96, p. 448.)

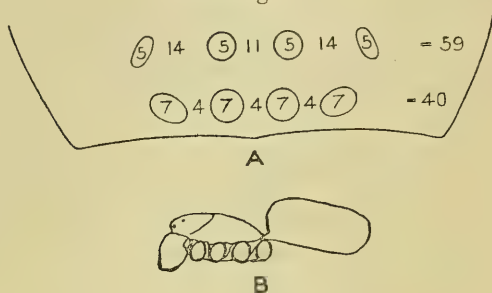
*Female*.—Cephalothorax bright red; mandibles, lip, and maxillæ red-brown with greyish-yellow hair; sternum dark brown with dark brown hair, paler in front. Abdomen brownish yellow with dark brown spots in front, behind which darker brown with brown hairs in thick transverse stripes; a dark brown stripe reaches from the anterior end into the dark brown mass. Under-side yellow-brown with irregular small brown spots, a narrow dark transverse stripe behind genital fold, and a faint broad shield-depression. Legs bright orange-brown above, duller underneath, thick yellowish upstanding hair; dark grey scopulæ.

*Cephalothorax* somewhat high, sloping from sides and rear in an almost continuous curve transversely and longitudinally. In front two-thirds the greatest breadth.

Front row of *eyes* straight; laterals only slightly larger than median, equidistant, three-quarters of diameter of median apart, front and rear median the diameter of front side-eyes apart; clypeus half of front median; rear median eyes nearer to one another than to the side-eyes.

On tibia iii. above is one spine, none on tibia iv.

Text-fig. 96.



*Isopeda pengellyi*.

A, eyes of female; B, profile.

*Measurements in millimetres.*

		Long.	Broad.			
Cephalothorax ...		11½	{ 7 11½			
Abdomen .....		14		11		
Mandibles .....		5 shorter than pat. i.				
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.	
Legs .....	1.	4½	13½	6½, 10 (16½)	14	= 48½
	2.	4½	15	18	15½	= 53
	3.	4½	12	13	11½	= 41
	4.	4½	12	13	13	= 42½
Palpi .....	2		5	4½	4½	= 16

One female from Pengelly, West Australia, and two from Darling Ranges, West Australia, sent by Mr. B. H. Woodward.

*ISOPEDA SAUNDERSI*, nov. sp. (Text-fig. 97.)

*Female*.—Cephalothorax and mandibles dull red-brown; lip and maxillæ dark brown, fringes orange; mandibular bristles greyish yellow; sternum black-brown, with thick matted hair extending over coxæ. Abdomen greyish yellow, with longitudinal scolloped

brown stripe, yellower underneath with short pale yellow hair; darker stripe behind epigyne, more or less developed in different specimens. Legs and palpi dull reddish brown, pale yellow-grey hairs; dark grey scopulæ.

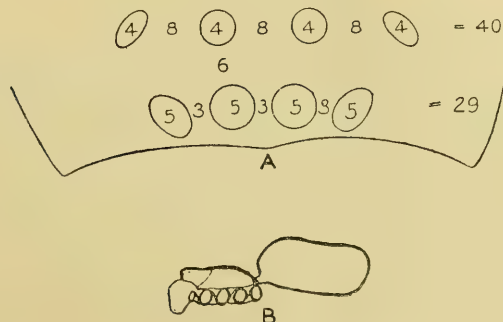
The *cephalothorax* is moderately high, rounded rather broadly in front. *Mandibles* short and broad, much rounded at base.

The *eyes* of the front row are nearly equal and equidistant, three-fifths diameter apart and same distance from the margin of the clypeus. The rear row is slightly procurved, the eyes are equidistant, twice the diameter of their median apart, which are four-fifths diameter of front. The front and rear medians are distant one and a half times the diameter of the rear median.

The *legs* are short and stout. Two spines above on tibia iii., but where sometimes missing the mark of posterior spine is not visible, none on tibia iv.

The scopula on metatarsus iv. thins off towards the base.

Text-fig. 97.

*Isopeda saundersi*.

A, eyes of female; B, profile.

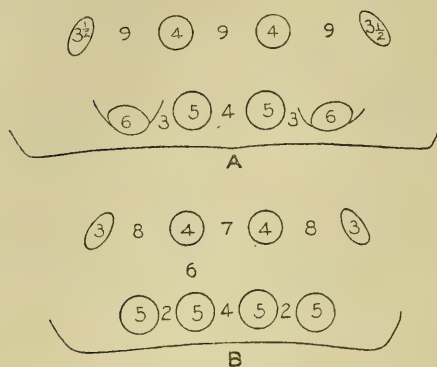
*Measurements in millimetres.*

	Long.	Broad.				
Cephalothorax ...	9	$\begin{cases} 5\frac{1}{2} \\ 9 \end{cases}$				
Abdomen .....	15	11				
Mandibles .....	4	= front patella.				
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.	
Legs .....	1.	3	$9\frac{1}{2}$	11	$10\frac{1}{2}$	= 34
	2.	3	$10\frac{1}{2}$	12	11	= $36\frac{1}{2}$
	3.	3	8	9	8	= 28
	4.	3	8	$9\frac{1}{2}$	$9\frac{1}{2}$	= 30
Palpi .....		$1\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	= 12

Two females from Chapman River, West Australia, were sent to Brit. Mus. by Mr. W. Saunders.



Text-fig. 98.

*Isopeda tietzi.*

A, eyes of female; B, eyes of male.

**ISOPEDA TIETZI, nov. sp. (Text-fig. 98.)**

*Female.* —Cephalothorax red-brown, covered with fine closely-lying yellow hair; mandibles darker red-brown, long yellowish-grey bristles; lip and maxillæ dark red-brown to black-brown; sternum black-brown, with thick velvety-black hair extending over the coxæ. Legs yellow-brown, with dingy yellow hair; silvery-white below the patella, brown at each end, and silvery-white in middle underneath the tibia of first and second pairs, fainter on third and fourth. Abdomen yellow-brown above and below, a dark stripe behind the genital fold and impressed shield-pattern.

The *males* vary from the same colour as the females to lighter yellow-brown and rather lighter mandibles, lip, and maxillæ. In one specimen the eyes are yellow on distinct black rims, in the others all yellow.

The *cephalothorax* is moderately high, and rounded some distance from the sides, a deep and long fovea with faint side striæ. The front row of *eyes* is slightly procurved, the side larger than the middle and only half the distance from them that the latter are from one another. The rear row are equidistant, and the distance between front and rear median greater than the diameter of the front median.

On tibia iii. in the females is one spine above, in the males two on tibia iii. and one on tibia iv.

*Measurements in millimetres.*

## Female (largest).

	Long.	Broad.
Cephalothorax ...	9	$\left\{ \begin{array}{l} 5\frac{1}{2} \text{ front.} \\ 9 \end{array} \right.$
Abdomen .....	15	11
Mandibles .....	$4\frac{1}{2}$	shorter than front patella.

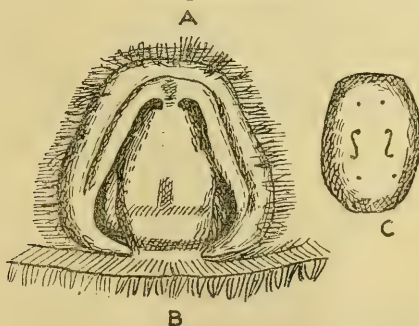
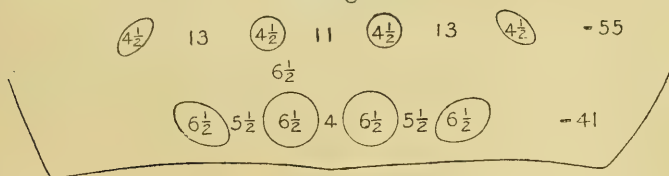
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.		
Legs .....	1.	3½	10	12	11	=	36½
	2.	3½	11	13	11½	=	39
	3.	3½	9½	9½	8½	=	31
	4.	3½	10	10	10	=	33½
Palpi .....		2½	4	4	4	=	14½

## Male (largest).

		Long.	Broad.				
Cephalothorax ...		8	{ 4½ 8				
Abdomen .....		8	6				
Mandibles .....		3½					
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.		
Legs .....	1.	3	11	13	13	=	40
	2.	3	13	14	14	=	44
	3.	3	9	9	9	=	30
	4.	3	10½	10½	11½	=	35½
Palpi .....		2	4	3	5	=	14

Males and females from Adelaide and environs sent to the South Australian Museum by Mr. A. Tietz, and one male from Victoria by Prof. Spencer.

## Text-fig. 99.



*Isopeda woodwardi.*

A, eyes of female; B, epigyne; C, upperside of abdomen.

*ISOPEDA WOODWARDI*, nov. sp. (Text-fig. 99.)

*Female*.—Cephalothorax red-brown, darker in front, yellowish hair; mandibles, lip, and maxillæ black-brown, brown bristles,

light red fringes; sternum red-brown, yellowish-brown hair. Abdomen dingy yellow-brown above, brighter below; three pairs of dark spots on back, the anterior and posterior pairs being round, and the median longitudinal lines as described by L. Koch in his *I. dolosa* and *I. villosa*; rather long downlying yellow hair; on the underside only a slightly darker coloured narrow transverse stripe behind the genital fold, and a faint shield-pattern. The legs and palpi are bright reddish brown, with long upstanding brown hair, the scopulæ darker yellowish grey.

The *cephalothorax* is rather flat, rounded at sides and broad in front; clypeus low, with a long and deep median sulcus, but only faint side striæ.

The front row of *eyes* are equal in size, the median pair being nearly two-thirds their diameter apart and nearly half as much again from the laterals, the row being straight, they are their diameter from the median of the rear row, which are two and a half diameters apart (three-quarters of median) and three from their laterals.

There are no spines on the upperside of tibia iii. or iv.

This is very like *Isopeda villosa* L. Koch, and the specimens from Central Australia (Horn Exp. pt. ii., Zool. p. 339) which I took to be *I. dolosa* L. Koch. It differs from the former in the front eyes being equal instead of laterals largest, and the side-eyes farther from middle than the latter are from one another, and the rear median nearer together than their distance from the side; the transverse stripe on the underside of the abdomen and the sternum are not so dark. They also differ from the latter in having the front row of eyes farther apart and not equidistant; legs longer in proportion, and cephalothorax not quite so flat.

*Measurements in millimetres.*

		Long.	Broad.				
Cephalothorax ...		11½	{	7½			
				11½			
Abdomen .....		17½		13½			
Mandibles .....		5½					
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.		
Legs .....	1.	5	13	6, 11 (17)	15	=	50
	2.	5	14½	20	17	=	56½
	3.	5	12	11	10	=	38
	4.	5	11½	13	11½	=	41
Palpi .....		2½	5	4	5	=	16½

One female from the interior of S. Australia, sent to Brit. Mus. by Mr. H. P. Woodward.

*ISOPEDA ROBUSTA* L. Koch.

*Isopeda robusta* L. Koch, Die Arachn. Austr. 1875, p. 691.

Koch described this from a single female in the Vienna

Collection. He says the rear middle eyes are  $1\frac{1}{2}$  times as far from the laterals as from one another. There are two dried specimens (females) in the Brit. Mus. Collection, without localities, which I refer to this—Koch's specimen had no locality other than Australia.

In those I have examined the eyes are black on yellow rims; except in this, the want of black markings, and the longer distance between median and side rear eyes, it is very near to my *I. woodwardi*, above.

#### ISOPEDA CORDATA L. Koch.

*Isopeda cordata* L. Koch, *loc. cit.* p. 694.

Koch described this from a non-adult female from Sydney and distinguishes it by the rear row of eyes being slightly recurved and having no scopula on metatarsus iv.

It has not been recorded since, and is a somewhat doubtful species.

#### ISOPEDA HIRSUTA L. Koch.

*Isopeda hirsuta* L. Koch, *loc. cit.* p. 693.

A male from Bowen, Queensland; not recorded since.

Has a light-coloured sternum, flat cephalothorax, no spines on tibia iii. or iv. above; front row of eyes equal and equidistant, very near the margin of the clypeus. It only seems to differ from *I. insignis* Thor. in having the front eyes farther apart.

#### ISOPEDA AUREA L. Koch.

*Isopeda aurea* L. Koch, *loc. cit.* p. 696.

Koch described a male and female (both young and undeveloped) from Port Mackay.

There is in the Brit. Mus. Collection a magnificent specimen (female) which I take to be the full-grown of his species, from Queensland also. It is red-brown, thickly covered with pale yellow to orange hair, the femora with brown spots underneath.

The measurements are as follows:—

		Long.	Broad.			
Cephalothorax ...		16½	{ 10½ 17			
Abdomen .....		16	14			
Mandibles .....		9	= front patella.			
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.	
Legs .....	1.	6	20	25	22	= 73
	2.	7	22	28	24	= 81
	3.	6	17	19	16	= 58
	4.	7	18	18	18	= 61
Palpi .....		3½	8	8	7	= 26½





Genus *TYPOSTOLA* E. Sim.

*Typostola* E. Sim. Hist. Nat. des Ar. vol. ii. p. 44.

Type species, *T. barbata* (L. Koch).

M. Simon removes this species from *Isopeda* and makes it the type of a new genus on the strength of the somewhat larger size of the rear median eyes compared with the laterals, and the curious development of a mass of very long and stout plumose bristles on the inner side of the mandibles and the outer side of the maxillæ.

In the specimens in the British Museum (two females and a male) the former point is not by any means clearly shown, but in the male palp the spiral support and flagellum are only partially developed, being in fact in the intermediate stage; it is therefore, I think, a quite good genus. The outer mandibular teeth are also five, instead of the four in *Isopeda*. The comparative nearness of the rear middle eyes in some cases makes the eye-square longer than broad.

The female specimens in the British Museum differ from one another in minor points, and considerably from the male. All three, so far as can be judged, are different from L. Koch's *T. barbata*, but it must be remembered that they are all single specimens. The Rev. O. P. Cambridge has a fine female agreeing with the largest *T. magnifica*, which he was good enough to allow me to inspect.

The following synopsis shows the chief points of difference. I am not quite satisfied as to how far *T. major* really differs from *T. barbata* L. Koch, but his drawing of the epigyne, if correct and from a fully adult specimen, should be conclusive.

- |  |                             |
|--|-----------------------------|
| A. Lip and maxillæ yellow-brown. Rear side-eyes longer than the front laterals and clearly much larger than the rear middle, at least in male. Cephalothorax shorter than tibia iii. ....  | <i>broomi</i> , nov. sp.    |
| B. Lip and maxillæ dark or nearly black-brown. Front and rear laterals of equal diameter.  |                             |
| a <sup>1</sup> . Lip and maxillæ scarcely any lighter at extremities. Cephalothorax clearly longer than broad, as long as tibia iv. and in front as wide as the mandibles are long .....   | <i>magnifica</i> , nov. sp. |
| b <sup>1</sup> . Lip and maxillæ much lighter at extremities than in the above. Cephalothorax as broad as long, clearly longer than tibia iv., and wider in front than mandibles are long. |                             |
| a <sup>2</sup> . The points of the chitinous oval of the epigyne widely apart at base. Rear middle eyes more than one and a half times their diameter apart.....                           | <i>major</i> , nov. sp.     |
| b <sup>2</sup> . Chitinous oval of epigyne closed at base ( <i>sec.</i> Koch). Rear middle eyes only slightly farther apart than their diameter .....                                      | <i>barbata</i> L. Koch.     |

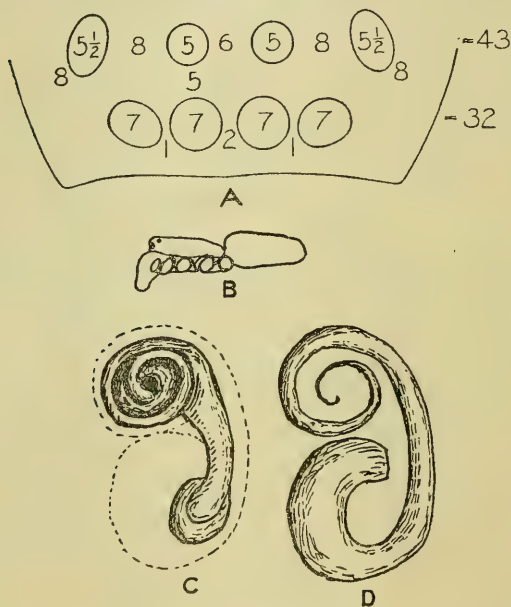
*TYPOSTOLA BROOMI*, nov. sp. (Text-fig. 100, p. 456.)

Cephalothorax, lip, and maxillæ orange-brown; mandibles the same but darker; beard pale orange; sternum and coxæ yellow with pale yellow hair; legs somewhat darker; scopulæ dark grey. Abdomen dingy orange with yellowish-grey hair, both lighter on underside, no signs of any pattern

The *cephalothorax* very slightly longer than broad, narrowing in front to half its width; fovea rather long and deep, with clearly-marked depressions bordering the cephalic part.

The front row of *eyes* are equal in diameter, half of same from margin of clypeus; the median are less than one-third of their diameter apart and only half of the same distance from the laterals, three-fourths of their diameter from the rear medians, which are slightly less than that distance in diameter and slightly farther apart. The rear row is straight, but the laterals are larger than the front laterals and a little farther from their median than the latter are apart. They bear to the latter in diameter the proportion of 8 to 5.

Text-fig. 100.

*Typostola broomi.*

A, eyes; B, profile; C, support in male palp; D, flagellum of male palp.

There are no spines on tibia iii. and iv. above.

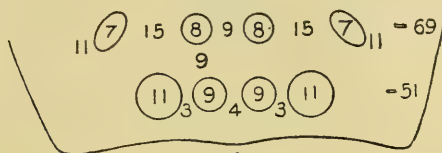
The scopulæ extend thickly to the base of metatarsi i., ii., & iii., and there is further a thick coating of hair on the underside of the tibia to the base of patella. The fourth pair of legs have been reproduced from the coxa and are abnormally small. The underside of the palpi has a thick divided scopula to the base of the femoral joint. The palpal flagellum and supporting-drum have about three spirals only, the latter on account of its shortness being cup-shaped.

The measurements in millimetres are as follows:—

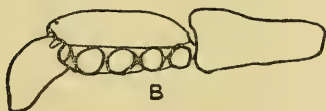
		Long.	Broad.			
Cephalothorax ...		9½	{ 4½ in front. 9			
Abdomen .....		11		8		
Mandibles .....		5 shorter than patella i.				
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.	
Legs .....	1.	4	17	21	20	= 62
	2.	4	18	23	22	= 67
	3.	4	12	16	14	= 46
	4.	4	9	12	12	= 37 <sup>1</sup>
Palpi.....		2½	5	5	4½	= 17

One male from Muldiva, N. Queensland, sent by Dr. Broom.

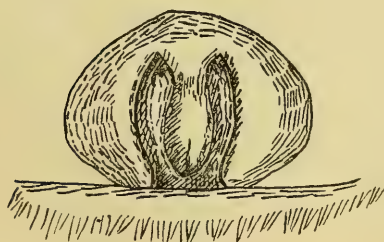
Text-fig. 101.



A



B



C

*Typostola magnifica.*

A, eyes; B, profile; C, epigyne.

**TYPOSTOLA MAGNIFICA**, nov. sp. (Text-fig. 101.)

Cephalothorax red-brown, somewhat darker about the eye-space; mandibles black-brown; lip and maxillæ dark red-brown, only slightly paler at upper edges, beards pale orange. The sternum and coxæ are bright orange, the front two pairs of the latter being somewhat darker than the posterior, the hair and bristles pale

<sup>1</sup> Abnormal.

yellow. The legs and palpi are red-brown above, paling to lighter red below; general hair-covering yellow, but scopulæ dark grey. The abdomen is a dingy greyish yellow above and below, three pairs of darker spots on the upperside; epigyne dark brown all over.

The *cephalothorax* is clearly broader than long, rounded at sides, square in front, where it is as broad as the rather stout mandibles are long. It is almost flat from the rear row of eyes to the rear slope, but slopes rather gradually from the sides; the median fovea is long and distinct.

The front row of *eyes* is slightly procurved, the laterals being half their diameter from the margin of the clypeus; the medians, which are a little smaller, being three-fourths. They are equidistant, less than one-third of their diameter. The rear row is straight, the laterals the same diameter as front laterals. The median pair are clearly smaller, four-fifths the diameter of front median, from which they are distant rather more than their diameter and the same distance apart, from their lateral they are nearly two of their diameters distant. The median eye-square is rather longer than broad.

The teeth on the mandibular sheath are large and powerful, on the inner side four large and one smaller, on the outer one large and one medium-sized.

The *legs* are long and powerful and somewhat cylindrical; thick scopulæ to base of metatarsi i., ii., and iii., two-thirds of metatarsus iv.; matted hair underneath the other joints except femur.

No spines above on tibia iii. or iv.

The *abdomen* is broadly ovate, covered with a thick mat of downlying hair; on the underside four longitudinal impressed lines form the indication of a shield. The epigyne is a broad oval with wide chitinous margin, and well-formed longitudinal median ridge dividing the inner portion, which is the same dark colour as the outer.

The measurements in millimetres are as follows:—

		Long.	Broad.			
Cephalothorax ...		17½	$\left\{ \begin{array}{l} 9 \\ 16\frac{1}{2} \\ 17\frac{1}{2} \end{array} \right.$			
Abdomen .....		22				
Mandibles .....		9				
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.	
Legs .....	1.	6	23	9, 22 (31)	28	= 88
	2.	6	25½	35	29	= 95½
	3.	6	19	23½	20	= 68½
	4.	6	20	7, 17½ (24½)	24	= 74
Palpi.....	4	9		9	8½	= 30½

The Rev. O. P. Cambridge has one female with slightly longer legs than this one, sent by Mr. D. Le Souëf to the British Museum; both are from Queensland.

TYPOSTOLA MAJOR, nov. sp.

Cephalothorax red-brown, somewhat darker in front, clothed with short yellow hair; nearly white between the eyes; mandibles black-brown; beard red-brown; lip and maxillæ red-brown, pale in front, fringes orange, beards pale yellow. Sternum and coxæ orange, the front one of latter thickly covered with long yellow hair, others bare. Legs bright reddish brown. Abdomen dark brown with brown hair.

The *cephalothorax* is very slightly longer than broad, distinctly longer than tibia iv., its square front is more than one-half its greatest breadth, and clearly broader than the mandibles are long. The median fovea and those at junction of cephalic part rather indistinct.

Both rows of *eyes* are straight, the laterals equal; the eyes of the front row are equidistant half the diameter of the median which are four-fifths the diameter of side, and their diameter distant from the rear median; the latter are more than once and a half of their diameter apart, being three-fifths of laterals, and more than twice their diameter from the latter. The median eye-square is as broad as long.

The *abdomen* is ovate, truncate in front, thickly covered with coarse downlying hair; three pairs of muscle-spots above and four longitudinal hair-lines on underside as in *T. magnifica*. The epigyne is white in the median area instead of dark-coloured as in the last, and is flat without any median ridge, the points of the horseshoe chitinous frame being well apart as in the *Isopeda* type generally.

The *legs* are comparatively rather shorter than the above and thickly covered with downlying hair; the femora underneath with long upstanding bristles. The palpi are thickly covered with hair on all joints and, without the maxillæ joints, are fully once and a half the length of the cephalothorax. L. Koch gives once and one-third for his *T. barbata*.

There is only one spine above on tibia ii., instead of two as in *T. magnifica*.

The measurements in millimetres are as follows:—

		Long.	Broad.			
Cephalothorax ...		$15\frac{1}{2}$	$\left\{ \begin{array}{l} 8\frac{1}{2} \\ 15 \end{array} \right.$			
Abdomen .....		$17\frac{1}{2}$	$13\frac{1}{2}$			
Mandibles .....		$7\frac{1}{2}$	= front patella.			
				Pat. & tib.	Metat. & tars.	
Legs .....	1.	Coxæ. 6	Tr. & fem. 20	25	$23\frac{1}{2}$	= $74\frac{1}{2}$
	2.	6	22	28	25	= 81
	3.	6	17	19	18	= 60
	4.	6	18	20	20	= 64
				(6, 14)		
Palpi.....		4	7	8	7	= 26

One female from Queensland.



Genus *PEDIANA* E. Simon.

*Heteropoda* L. Koch, Ar. Austr. 1875 (ad partim *H. regina*).

*Pediana* E. Simon, Rev. Spar. 1880, p. 38.

*Polydamna* Thor. Rag. Mal. e Pap. 1881, p. 299.

*Pediana* E. Simon, Hist. Nat. des Ar. vol. ii. p. 56.

Type species, *P. regina* L. Koch.

This genus was formed by M. Simon in 1880 for L. Koch's *Heteropoda regina* from Queensland, and Thorell soon after picked it out for a new genus which he called *Polydamna*, from Yule Island, Torres Strait. Apparently the only male known is described by the latter, and his description of the male palp with four spirals confirms my belief that it belonged to this group and not to the *Heteropodeæ*, to which it could be ascribed only by the length of the median eye-space.

My *Isopeda horni* (Horn Exp. vol. ii. Zool. p. 340) really belongs to this genus, and two more species in the British Museum now bring up the number to four. The whole eye-space is raised up on a low flat tubercular region. The legs are rather short and thin, the two front pairs being of equal length. The rear row of eyes is slightly procurved, the eyes being about equal in size; the front row straight or recurved, with the eyes either equal or the laterals slightly larger. The median eye-square is clearly longer than broad.

The species can be distinguished as follows:—

- a. Front row of eyes equal in size.
  - a<sup>1</sup>. On underside of abdomen a black lunate transverse stripe behind epigyne and similar smaller stripe in front of spinnerets; intermediate space bright reddish brown. Cephalothorax 6 to 7 mm. in length. One spine on tibia iii. and iv. above ..... *regina* L. K.
  - b<sup>1</sup>. An ill-defined dark patch behind epigyne; no stripe in front of spinnerets; intermediate space dull yellow-brown, with irregular dark spots. Cephalothorax about 10 mm. in length. No spine on tibia iii. or iv. above ..... *horni* Hogg.
- b. Front lateral eyes larger than median. One spine on tibia iii. and iv.
  - c<sup>1</sup>. On the underside of femora i. and ii. bright red hair. Cephalothorax about 10 mm. long. Eyes bright orange ..... *tenuis*, nov. sp.
  - d<sup>1</sup>. Underside of femora yellowish brown, dark, hairy. Cephalothorax 6 to 7 mm. long. Eyes black. Three teeth only on outer side of falx-sheath ..... *occidentalis*, nov. sp.

*PEDIANA REGINA* (L. Koch).

*Heteropoda regina* L. Koch, Die Arachn. Austr. vol. ii. 1875, p. 716.

*Pediana regina* L. Koch, E. Simon, Rev. Sparass. 1880, p. 39.

*Polydamna regina* L. Koch, T. Thorell, Rag. Mal. e Pap. vol. iii. 1881, p. 300.

A female in the Keyserling Collection, Brit. Mus., has irregular darker brown patches on a yellow-brown ground on the upper-side of the abdomen; on the underside a transverse black spot

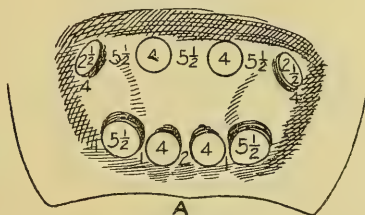
close to the front margin, a broad lunate band behind the epigyne, and a smaller black band in front of the spinnerets. Three larger and one very small tooth on underside of falx-sheath, two on upperside.

*Measurements in millimetres.*

		Long.	Broad.				
Cephalothorax ...		7	$6\frac{1}{2}$				
Abdomen .....		9	$6\frac{1}{2}$				
Mandibles .....		$3\frac{1}{2}$	= front patella.				
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.		
Legs .....	1.	3	$8\frac{1}{2}$	$9\frac{1}{2}$	$8\frac{1}{2}$	=	$29\frac{1}{2}$
	2.	3	$8\frac{1}{2}$	$9\frac{1}{2}$	$8\frac{1}{2}$	=	$29\frac{1}{2}$
	3.	$2\frac{1}{2}$	7	7	6	=	$22\frac{1}{2}$
	4.	3	8	8	8	=	27
Palpi .....		$1\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$	2	=	$8\frac{1}{2}$

*Loc.* Yule Island (New Guinea); Cape York, N. Queensland; Bowen, Gayndah, Peak Downs, Queensland.

Text-fig. 102.



A



B

*Pediana occidentalis.*

A, eyes; B, epigyne.

*PEDIANA OCCIDENTALIS*, nov. sp. (Text-fig. 102.)

This species is on the whole very like *P. regina*.

The cephalothorax and mandibles are dark red-brown, the hairing pale yellow; lip and maxillæ rather darker; sternum

dark orange; coxæ, legs, and palpi bright orange. Abdomen above rough dark brown skin with fine yellowish hairs; the underside paler with a small dark lunate stripe behind epigyne, but no others.

The *cephalothorax* is rather longer than broad, rounded at sides, a deep thin fovea enlarged at each end, shallow corrugations along each side of thoracic part.

The *eye-space* is on a low flat quadrangle distinctly raised at the rear as well as at the sides; the rear row is clearly procurved, the rearmost point of lateral eyes reaching only to a line passing through the middle of the medians; the eyes equidistant, equal in size to one another and to the front median. These latter are half their diameter apart and about half that distance from the laterals, which are clearly larger than the median.

There are only three teeth on lower edge of falx-sheath, the fourth, small one, of *P. regina* having disappeared. The epigyne of the female is much squarer and more open at the base than in the latter.

*Measurements in millimetres.*

		Long.	Broad.			
Cephalothorax ...		6	$\left\{ \begin{array}{l} 3\frac{1}{2} \\ 5 \end{array} \right.$			
Abdomen .....		8	6			
Mandibles .....		3 longer than pat. i.				
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.	
Legs .....	1.	$2\frac{1}{2}$	$8\frac{1}{2}$	$9\frac{1}{2}$	$8\frac{1}{2}$	= 29
	2.	$2\frac{1}{2}$	$8\frac{1}{2}$	$9\frac{1}{2}$	$8\frac{1}{2}$	= 29
	3.	2	7	7	$6\frac{1}{2}$	= $22\frac{1}{2}$
	4.	$2\frac{1}{2}$	8	8	8	= $26\frac{1}{2}$
Palpi .....		$1\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$	2	= $8\frac{1}{4}$

Two females from Perth, West Australia, in Brit. Mus.

*PEDIANA HORNII* Hogg.

*Isopeda horni* Hogg, Rep. Horn Exp. vol. ii. Zool. 1896, p. 340.

The eyes of the front row are equal in size; epigyne oval like that of *P. regina*; no spines on tibia iii. or iv.; the front and rear legs are set on rather straight.

*Loc.* Oodnadatta, South Australia.

*PEDIANA TENUIS*, nov. sp. (Text-fig. 103.)

This species more closely resembles the preceding; they are both larger and less brightly coloured than *P. regina*; the eyes are set on a similar raised space.

The cephalothorax, legs, palpi, mandibles, sternum, lip, and maxillæ are all black-brown with pale brown hair. The undersides of the femora of front two pairs of legs are bright red spotted with black; the abdomen above is yellowish grey, below reddish brown hair; a black transverse area behind the epigyne is rather deeper than in *P. horni*, almost a short pointed shield.

The *eyes* are bright orange; those of the front row, on a plane



Genus *EODELENA*, nov.

This genus I have formed for two specimens, one a fully developed male, the other not adult, sent to the British Museum by Prof. Baldwin Spencer, of Melbourne, in 1888. They were collected on King's Island, Bass's Straits, and, but for their smaller size, in general appearance are scarcely distinguishable from *Delena cancerides* Walck. On looking at the male palp, however, it is seen that what should be a flagellum of ten spirals makes less than one whole turn round the end of the conductor, which is merely flattened and curls round far enough to be the shape of a hook. As the palp does not develop by degrees, but comes out fully formed after casting the skin at the last moult, this must either be a reversion to an ancient form or a remanet. The fact that the palpal development is so similar through different genera indicates that it is an older development than that of the form of cephalothorax &c.; and as the flattened forms must almost of a certainty succeed the unflattened, it is more likely to be a reversion to the original type than to have remained on without alteration. However, if such were thought likely, the hills (now islands in Bass's Straits) would be a not unlikely place for the ancestors to remain. It is in any case an interesting instance of the reproduction of a missing link, and indicates the line along which the specialization has taken place.

Type, *Eodelena spenceri*.

*EODELENA SPENCERI*, nov. sp. (Text-fig. 104.)

This species differs in nowise in coloration and shape from *Delena cancerides*, but has the important difference detailed above, and the tibial apophysis of male palp is single instead of double.

In the front row of eyes the laterals are nearer to the medians than in that species, being once and a half the distance between the latter.

*Measurements in millimetres.*

		Male.					
		Long.	Broad.				
Cephalothorax ...		$6\frac{1}{2}$	$6\frac{1}{2}$				
Abdomen .....		$6\frac{1}{2}$	$5\frac{1}{2}$				
Mandibles .....		3					
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.		
Legs .....	1.	$2\frac{1}{2}$	8	$10\frac{1}{2}$	$9\frac{1}{2}$	=	$30\frac{1}{2}$
	2.	$2\frac{1}{2}$	10	13	12	=	$37\frac{1}{2}$
	3.	2	7	7	7	=	23
	4.	$2\frac{1}{4}$	8	8	8	=	$26\frac{1}{4}$
Palpi .....	1		$2\frac{1}{2}$	$1\frac{1}{2}$	2	=	7



Text-fig. 104.

*Eodelena spenceri*.

A, eyes; B, male palp; C, flagellum and support.

## Female (not fully adult).

		Long.	Broad.				
Cephalothorax ...		$6\frac{1}{2}$	$6\frac{1}{2}$				
Abdomen .....		9	7				
Mandibles .....		3					
		Coxæ.	Tr. & fem.	Pat. & tib.	Metat. & tars.		
Legs .....	1.	$2\frac{1}{2}$	$8\frac{1}{2}$	9	$8\frac{1}{2}$	=	$28\frac{1}{2}$
	2.	$2\frac{1}{2}$	8	$8\frac{1}{2}$	8	=	27
	3.	$2\frac{1}{4}$	7	7	7	=	$23\frac{1}{4}$
	4.	$2\frac{1}{2}$	$8\frac{1}{2}$	$8\frac{1}{2}$	$8\frac{1}{2}$	=	28
Palpi .....							

Genus *DELENA* Walck.*Delena* Walck. Apt. tom. i. p. 490 (1837).*DELENA* *CANCERIDES* Walck.

This is the only species of the genus found on the mainland of  
 PROC. ZOOL. SOC.—1902, VOL. II. No. XXX. 30

Australia and has been recorded from wherever collections have been made at all.

Walckenaer states that the first specimens were brought to Europe from Tasmania by M. Péron (in 1804). The cephalothorax and abdomen are more flattened than in any other species of the family, while the typically laterigrade position of its legs enables it to hide in very narrow crevices, but otherwise leaves it rather helpless. It is somewhat remarkable that with its wide range there should be very little variation in colour or form, this being the only species in the Australasian region. The palpal spiral has ten or eleven turns.

*Loc.* Australia, Tasmania.

I wish heartily to express my great indebtedness to Prof. Stirling, F.R.S., of the South Australian Museum, Adelaide, for providing me with much important material, and to Mr. R. I. Pocock, of the British Museum, not only for placing at my disposal the collection in his charge, but for his valuable advice, freely given on the many occasions when doubts and difficulties have presented themselves.

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| <p><i>Vulpes</i><br/>         <i>sp.</i>, 5.<br/>         <i>ægyptiaca</i>, 5.</p> <p><i>Waigeum</i><br/>         <i>ceramicum</i>, 115, 121.<br/>         <i>subcæruleum</i>, 115.</p> <p><i>Xanthoura</i><br/>         <i>jolyæa</i>, 60.</p> <p><i>Xenomystus</i><br/>         <i>nigri</i>, 326.</p> <p><i>Xenopterus</i>, 292, 293,<br/>         294, 295.<br/>         <i>bellangeri</i>, 294, 295.<br/>         <i>naritus</i>, 294, 295.</p> <p><i>Xenopus</i><br/>         <i>lævis</i>, 15, 79.</p> <p><i>Xerus</i><br/>         <i>brachyotus</i>, 310.</p> | <p><i>Xerus</i><br/>         <i>dabagalla</i>, 310.<br/>         <i>flavus</i>, 310.<br/>         <i>fuscus</i>, 310.<br/>         <i>rutilus</i>, 310.</p> <p><i>Xiphocerus</i>, 268.</p> <p><i>Xiphocolaptes</i><br/>         <i>phæopygus</i>, 60.</p> <p><i>Xyaste</i>, 244.<br/>         <i>fumosa</i>, 242, 245, 268,<br/>         269, 284.<br/>         <i>invida</i>, 242, 245, 250,<br/>         268, 269, 284.<br/>         <i>torrida</i>, 242, 267,<br/>         269.</p> <p><i>Xylocopa</i><br/>         <i>latipes</i>, 261, 262, 283.</p> <p><i>Xylophagus</i><br/>         <i>sp.</i>, 264, 283.</p> <p><i>Xylotrechus</i><br/>         <i>decoratus</i>, 249, 251,<br/>         282.</p> | <p><i>Xylotrechus</i><br/>         <i>pedestris</i>, 249, 252,<br/>         282.</p> <p><i>Xystrocera</i><br/>         <i>alcyonea</i>, 249, 282.</p> <p><i>Zachria</i>, 423, 454.<br/>         <i>flavicomæ</i>, 454.<br/>         <i>hæmorrhoidalis</i>, 454.<br/>         <i>oblonga</i>, 454.</p> <p><i>Zatteria</i>, gen. nov.,<br/>         62.<br/>         <i>browni</i>, 62, 72.</p> <p><i>Zelota</i>, gen. nov.,<br/>         273.<br/>         <i>spathomelina</i>, 242, 247,<br/>         274, 284.</p> <p><i>Zenaida</i><br/>         <i>maculata</i>, 59.</p> |
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THE END.





# THE ZOOLOGICAL SOCIETY OF LONDON.

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THIS Society was founded in 1826 by Sir STAMFORD RAFFLES, Mr. J. SABINE, Mr. N. A. VIGORS, and other eminent Naturalists, for the advancement of Zoology and Animal Physiology, and for the introduction of new and curious subjects of the Animal Kingdom, and was incorporated by Royal Charter in 1829.

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Any FELLOW, having paid all fees due to the Society, is at liberty to withdraw his name upon giving notice in *writing* to the Secretary.

Persons who wish to become Fellows of the Society are requested to communicate with the undersigned.

PHILIP LUTLEY SCLATER, M.A., D.Sc., F.R.S.,  
*Secretary.*

3 Hanover Square, London, W.,  
October, 1902.

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FOR  
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(AT 3 HANOVER SQUARE, W.)  
**Session 1902-1903.**

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1903.			
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*The Chair will be taken at half-past Eight o'clock in the Evening precisely.*

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## OF THE

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THE scientific publications of the Zoological Society of London are of two kinds—"Proceedings," published in an octavo form, and "Transactions," in quarto.

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[October, 1902.]



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P. L. SCLATER,

*Secretary.*

*October, 1902.*

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
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1902, vol. II.

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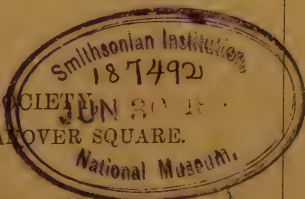
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## NOTICE.

The 'Proceedings' for the year are issued in four parts, forming two volumes, as follows:—

### VOL. I.

- Part I. containing papers read in January and February, in June.  
II. " " " March and April, in August.

### VOL. II.

- Part I. containing papers read in May and June, in October.  
II. " " " 9 1 8 November and December, in April.







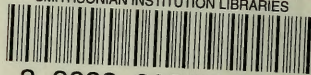








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